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Final

Volume IV

Hot Forming Subcategory

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NEW SOURCE PERFORMANCE STANDARDS
and
PRETREATMENT STANDARDS
for the
IRON AND STEEL MANUFACTURING POINT SOURCE CATEGORY

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Volume IV of six volume set which presents data rationale and technical aspects of the final effluent limitations and standards for the iron and steel industry published in the Federal Register on May 27, 1982 (47 FR 23258-317). Volume IV describes the general methodology and issues whereas the remaining volumes contain specific subcategory reports. Volume IV pertains to the Hot Forming subcategories.

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HOT FORMING SUBCATEGORY

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SECTION I

PREFACE

The USEPA has promulgated effluent limitations and standards for the steel industry pursuant to Sections 301, 304, 306, 307 and 501 of the Clean Water Act. The regulation contains effluent limitations guidelines for best practicable control technology currently available (BPT), best conventional pollutant control technology (BCT), and best available technology economically achievable (BAT) as well as pretreatment standards for new and existing sources (PSNS and PSES) and new source performance standards (NSPS).

This part of the Development Document highlights the technical aspects of EPA's study of the Hot Forming Subcategory of the Iron and Steel Industry. Volume I of the Development Document addresses general issues pertaining to the industry, while other volumes contain specific subcategory reports.

HOT FORMING SUBCATEGORY

SECTION II

CONCLUSIONS

Based upon the current study, a review of previous studies, and comments received on the regulation proposed on January 7,1981 (46 FR 1858), the Agency has reached the following conclusions:

1. The Agency has combined all hot forming operations into one subcategory. The four major subdivisions of the subcategory reflect significant differences in production processes and wastewater flows. To further account for product related flow differences, three of the subdivisions have been segmented on the basis of process differences (scarfing), type of metal (carbon or speciality), and type of product (plate or strip). All hot forming wastewaters are similar in character and can be treated to the same effluent levels. The hot forming subcategory is subdivided as follows:

   Hot Forming - Primary
      Carbon and Specialty Operations wo/scarfers
      Carbon and Specialty Operations w/scarfers

   Hot Forming - Section
      Carbon Operations
      Specialty Operations

   Hot Forming - Flat
      Hot Strip and Sheet Operations
      Carbon Plate Operations
      Specialty Plate Operations

   Hot Forming - Pipe and Tube

2. The BPT, BCT, and NSPS, limitations and standards are based upon model plant flow rates (applied and discharge) and effluent quality determined from the expanded data base of the industry that the Agency obtained as part of this study. While these model flow rates are different than those used to develop the limitations promulgated in 1976, they are more representative of the wastewater flows of the industry. Thus, the Agency believes it is appropriate to the wastewater flows of establish effluent limitations based upon these flow data.

3. During this study, the Agency found that untreated wastewaters from hot forming operations contain significant levels of conventional and toxic metal pollutants. Toxic organic pollutants were found only at low levels and only in some hot forming wastewaters. As shown below, the Agency finds that

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discharges of these pollutants can be controlled by the BPT model treatment system. These technologies are well demonstrated throughout the hot forming subcategory.

	Direct Discharge Effluent Loadings (Tons/Year)	
	Raw Waste	BPT
Flow, MGD	3,680	1,419
TSS	5,878,201	15,081
Oil and Grease	174,540	3,078
Toxic Metals	49,460	114

	Indirect Discharge Effluent Loadings (Tons/year)	
	Raw Waste	Current Discharge
Flow, MGD	295	118
TSS	444,156	1,284
Oil and Grease	13,777	449
Toxic Metals	3,505	32

4. Although several toxic metal pollutants were identified in the untreated wastewaters from hot forming operations, BAT effluent limitations have not been promulgated for these pollutants. The Agency has concluded the discharge of toxic metals is adequately controlled by the the model BPT treatment system. Thus, BAT limitations and pretreatment standards have not been promulgated for hot forming operations. The Agency did not promulgate pretreatment standards for hot forming operations because there are relatively few indirect hot forming dischargers; all indirect hot forming discharges are treated to a level where significant quantities of toxic metals will not enter POTWs; and, because of the user fees for POTWs, the Agency does not expect that any untreated discharges of hot forming wastewaters will be directed to POTWs.

5. The Agency estimates that the industry will incur the following costs to comply with the BPT limitations for facilities in place as of July 1, 1981. The Agency has determined that the effluent reduction benefits associated with compliance with the effluent limitations justify the costs presented below:

	Costs (Millions of July 1, 1978 Dollars)			
	Investment		Annual	
	In-place	Required	In-place	Required
BPT	380.1	94.9	-40.8	12.0

The Agency has also determined that the effluent reduction benefits associated with compliance with new source performance standards (NSPS) justify those costs.

6. Information provided by the industry indicate that recycle components included in the Agency's BPT and NSPS model treatment systems, are in use at hot forming plants and present no significant problems pertaining to scaling, fouling, or plugging.

7. The model new source performance standards treatment system is based upon high rate (96%) recycle of hot forming wastewater.

8. With regard to "remand" issues, the Agency concludes that:

   a. The age of a plant has little or no effect upon the ease or cost of retrofitting pollution control equipment. Therefore, neither relaxed limitations for "older" plants nor less stringent limitations based upon retrofit costs are established for hot forming operations.

   b. The BPT model wastewater treatment system does not include evaporative cooling systems. Hence, BPT limitations promulgated for the hot forming subcategory will not increase the consumptive use of water to any significant degree. The NSPS treatment system includes an evaporative cooling system but the amount of water consumed as a result of the installation of this technology will be minimal. The Agency concludes that the effluent reduction benefits associated with NSPS justify the minor consumptive water losses which new source plants would incur both on a national basis, and on an "arid" and "semi-arid" regional basis. Recycle systems including evaporative cooling towers and evaporative cooling ponds are in use at plants located in arid and semi-arid regions of this country. Additional details on these and other remand issues are presented in Volume I and in Section VIII of this report.

9. Table II-1 presents the treatment model flow and effluent quality data used to develop the promulgated BPT and BCT effluent limitations for the hot forming subcategory, and Table II-2 presents these limitations. Table II-3 presents the treatment model flow and effluent quality data used to develop the promulgated NSPS. Table II-4 presents the standards contained in the regulation for NSPS.

10. The cost data presented above are different than those used by the Agency in the economic impact analysis completed for this regulation. The Agency found an error in the model treatment system flow rate for carbon steel section mills. The error resulted in an overstatement of the required cost of compliance used in the economic impact analysis (about $1.1 million in investment costs, and $0.15 million in annual costs). The Agency does not consider these differences significant in terms of whether or not the effluent reduction benefits are justified, or in terms of the economic impact analysis.

TABLE II-1

BPT/BCT TREATMENT MODEL FLOWS AND EFFLUENT QUALITY - HOT FORMING SUBCATEGORY

Subdivision	Flow (GPT)	30-Day Average and Daily Maximum Concentrations			
		TSS			
		Avg	Max	O&G[1]	pH (Units)
1. Primary					
a. wo/scarfers	897	15	40	10	6 - 9
b. w/scarfers	1326	15	40	10	6 - 9
2. Section					
a. carbon	2142	15	40	10	6 - 9
b. specialty	1344	15	40	10	6 - 9
3. Flat					
a. hot strip	2560	15	40	10	6 - 9
b. carbon plate	1360	15	40	10	6 - 9
c. specialty plate	600	15	40	10	6 - 9
4. Pipe & Tube	1270	15	40	10	6 - 9

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(1) Daily maximum concentration only.

TABLE II-2

BPT/BCT EFFLUENT LIMITATIONS
HOT FORMING SUBCATEGORY

	30-Day Average and Daily Maximum Effluent Limitations (kg/kkg of Product)			
	TSS			
Subdivision	Avg	Max	O&G (1)	pH (Units)
1. Primary				
a. wo/ scarfers	0.0561	0.150	0.0374	6 - 9
b. w/ scarfers	0.0830	0.221	0.0553	6 - 9
2. Section				
a. carbon	0.134	0.357	0.0894	6 - 9
b. specialty	0.0841	0.224	0.0561	6 - 9
3. Flat				
a. hot strip	0.160	0.427	0.107	6 - 9
b. carbon plate	0.0851	0.227	0.0567	6 - 9
c. specialty plate	0.0375	0.100	0.0250	6 - 9
4. Pipe & Tube	0.0795	0.212	0.0530	6 - 9

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(1) Daily maximum effluent limitations only.

TABLE II-3

TREATMENT MODEL FLOWS AND EFFLUENT QUALITY
HOT FORMING SUBCATEGORY

	Flow Rates (gal/ton)			
Subdivision	BAT	NSPS	PSES	PSNS
1. Primary				
a. w/o Scarfers	90	90	897	897
b. w Scarfers	140	140	1326	1326
2. Section				
a. Carbon	200	200	2142	2142
b. Specialty	130	130	1344	1344
3. Flat				
a. Hot Strip & Sheet	260	260	2560	2560
b. Carbon Plate	140	140	1360	1360
c. Specialty Plate	60	60	600	600
4. Pipe & Tube	220	220	1270	1270

	30-Day Average and Daily Maximum Concentrations							
	BAT(1)		NSPS		PSES(2)		PSNS(2)	
Pollutant	Avg	Max	Avg	Max	Avg	Max	Avg	Max
TSS	-	-	15	40	-	-	-	-
O&G	-	-	-	10	-	-	-	-
pH (Units)	-		6.0 to 9.0		-		-	

Note: Concentrations apply to all hot forming subdivisions and are expressed in mg/l unless otherwise noted.

(1) BAT limitations have not been promulgated.
(2) Only the General Pretreatment Regulations (CFR Part 403) apply.

TABLE II-4

EFFLUENT LIMITATIONS AND STANDARDS
HOT FORMING SUBCATEGORY

30-Day Average and Daily Maximum Effluent Limitations and Standards (kg/kkg of Product)

	BAT(1)		NSPS		PSES(2)		PSNS(2)	
Pollutants	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.
1. Primary								
a. Without Scarfers								
TSS	-	-	0.00563	0.0150	-	-	-	-
Oil & Grease	-	-	-	0.00375	-	-	-	-
pH (Units)	-		6.0 to 9.0		-		-	
b. With Scarfers								
TSS	-	-	0.00876	0.0234	-	-	-	-
Oil & Grease	-	-	-	0.00584	-	-	-	-
pH (Units)	-		6.0 to 9.0		-		-	
2. Section								
a. Carbon								
TSS	-	-	0.0125	0.0334	-	-	-	-
Oil & Grease	-	-	-	0.00834	-	-	-	-
pH (Units)	-		6.0 to 9.0		-		-	
b. Specialty								
TSS	-	-	0.00814	0.0217	-	-	-	-
Oil & Grease	-	-	-	0.00542	-	-	-	-
pH (Units)	-		6.0 to 9.0		-		-	
3. Flat								
a. Hot Strip and Sheet								
TSS	-	-	0.0163	0.0434	-	-	-	-
Oil & Grease	-	-	-	0.0108	-	-	-	-
pH (Units)	-		6.0 to 9.0		-		-	
b. Carbon Plate								
TSS	-	-	0.00876	0.0234	-	-	-	-
Oil & Grease	-	-	-	0.00584	-	-	-	-
pH (Units)	-		6.0 to 9.0		-		-	
c. Specialty Plate								
TSS	-	-	0.00375	0.0100	-	-	-	-
Oil & Grease	-	-	-	0.0025	-	-	-	-
pH (Units)	-		6.0 to 9.0		-		-	
4. Pipe & Tube								
TSS	-	-	0.0138	0.0367	-	-	-	-
Oil & Grease	-	-	-	0.00918	-	-	-	-
pH (Units)	-		6.0 to 9.0		-		-	

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(1) BAT limitations have not been promulgated.
(2) Only the General Pretreatment Regulations (CFR Part 403) apply.

HOT FORMING SUBCATEGORY

SECTION III

INTRODUCTION

General Discussion

Hot forming is the process in which hot steel, initially in solid ingot form or in intermediate shapes, is reduced in cross-section through a series of forming steps, ultimately producing finished and semi-finished steel products. These products have numerous cross-sections, lengths and tonnages. While several different types of hot forming mills are in use today, the hot forming processes have been grouped into one subcategory with the following major subdivisions.

Primary Mills
Section Mills
Flat Mills
Pipe and Tube Mills

Figure III-1 illustrates the sequences involved in hot forming operations.

Process wastewaters originating in the hot forming processes require treatment prior to discharge to receiving waters. Those wastewaters contain large amounts of suspended solids, oil and grease, and to a lesser extent, toxic metal pollutants. Toxic organic pollutants have been detected in some hot forming wastewaters. This report reviews wastewater treatment systems used at hot forming operations and presents model treatment systems and applicable effluent limitations and standards.

Data Collection Activities

The Agency sampled a total of 101 hot forming operations to obtain process information and wastewater quality data. The originally promulgated limitations for hot forming operations were based primarily upon data obtained through field sampling at 52 mills. Sixty operations were sampled during the recent toxic pollutant surveys (eleven operations were resampled). Table III-1 presents a short description of each mill sampled.

The general methodology and approach for data collection is described in Volume I. Information regarding applied and discharge flow rates, treatment systems in use, production capacities and modes of operation were provided by the industry for 485 mills. Tables III-2 through III-7 summarize the information received for the respective hot forming processes.

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In an effort to gather additional data, the Agency issued detailed data collection portfolios (D-DCPs) for thirty-one hot forming operations. These questionnaires were designed to gather information on long-term effluent quality, treatment costs and other operating data.

Tables III-8 through III-12 summarize the data base for this report.

Description of Hot Forming Operations

Primary Rolling Mills

The hot forming, primary mill is used to produce semi-finished products from re-heated steel ingots. Primary mills produce either blooms or slabs. Slabs are oblong shapes with cross-sections varying from 2" to 6" thick and 24" to 60" wide. Blooms are square or slightly oblong and are generally in the range of 6" x 6" to 10" x 12". These product dimensions are typical reference sizes. A wide range of cross-sections are produced in primary mills. Blooming, and slabbing mills are generally identified by the number of rolls or by the roll diameter and length, such as a two high reversing mill or a 45" x 90" slabbing mill. Blooming mills may be coupled with billet mills so that the semi-finished bloom can immediately be rolled in the billet mill without reheating.

The operation of a typical primary mill is described below:

The hot steel ingots are transferred to the primary mills from soaking pit furnaces which uniformly heat the steel ingots to the desired rolling temperature, usually 1180 to 1340°C (2,156 to 2,444°F). The soaking pits also act as storage areas to compensate for production variations in the flow of steel ingots between the steelmaking facilities and primary rolling mills. The soaking pit furnaces are square, rectangular, or circular, fuel fired (i.e., oil, gas), refractory lined pits constructed with the top of the pits several feet above ground level. The soaking pits are usually arranged in rows and are installed in a building adjacent to or within the primary mill. The ingots are placed into the soaking pits in an upright position through openings in the top. Removable covers are used to close the pit openings. The pits are spanned by one or more cranes equipped with ingot lifting tongs for placing and removing the steel ingots. The crane removes the properly heated steel ingots and places them into an electrically driven ingot transfer car which automatically delivers the ingots to the primary rolling mill.

The mill approach tables transport the ingot to the front table or roller table in preparation for rolling. Some mills are equipped with a scale in the ingot receiving table or mill approach tables for weighing the ingot prior to rolling. Depending upon the type of primary mill (i.e., reversing, tandem), the hot ingot is passed between the mill rolls and reduced in cross-section. In a reversing mill, the ingot is rolled through the same mill stand a number of times. A tandem mill is comprised of several mill stands such that the ingot is continuously rolled forward in one direction. Mill speeds are generally 200 to 400 feet per minute. During the rolling cycle, the ingot is transported to and from the mill stands by reversing rolls. The rolls are 12 to 21 inches in diameter and are spaced 2 to 3 feet apart. These rolls are driven by line shafts. After the ingot is rolled to the desired size, the end of the bloom, slab, or billet is cut off or "cropped." A crop shear is also used to cut long rolled sections into several shorter pieces.

The industry is paying increased attention to the conditioning of semi-finished products as the demand for high quality steel products increases. The removal of surface defects from blooms, billets, and slabs prior to final rolling is a major consideration. Defects such as rolled seams, light scabs, and checks generally retain their identity during subsequent forming processes and result in products of inferior quality. These surface defects may be removed by hand chipping, machine chipping, scarfing, grinding, milling, and hot steel scarfing. The various mechanical means of surface preparation are common to all metal working and machine shop operations. Scarfing is a process of supplying streams of oxygen as jets to the surface of the steel product under treatment, while maintaining high surface temperatures, which results in the rapid oxidation and localized melting of a thin layer of the metal. The process may be done manually (involving the continuous motion of an oxyacetylene torch along the length of the product) but in recent years automatic hot scarfing has come into wide use. The scarfing machine is located at the mill run out tables or at the shear approach tables.

The automatic hot scarfing process first uses flames generated by the burning of oxygen and fuel (either acetylene or natural gas) to preheat the semifinished product surface to steel melting temperatures. A continuous stream of pure oxygen is then directed onto the reheated steel surface and the semifinished product is then moved at a controlled speed through the scarfing machine. The oxygen applied to the entire surface of the billet, bloom or slab oxidizes the steel surface, and removes a surface layer to a predetermined depth, typically not in excess of 1/8 inch.

The automatic scarfing machine scarfs steels at speeds between 50 to 200 feet per minute. A typical operating cycle for an automatic hot scarfer is shown below.

a.	Position product	7 seconds
b.	Close scarfing units around product	3 seconds
c.	Preheat product surface	5 seconds
d.	Scarf (Oxygen on)	30 seconds
e.	Retract scarfing units	5 seconds
	Total	50 seconds

The scarfing machine is mounted on a motor driven carriage on rails and can be moved in and out of the primary rolling mill run out table line. The removal of the surface metal results in a continuous production of molten slag. The quantity of slag generated depends upon the section size and depth of cut and is removed by high pressure water sprays.

Scarfing also results in appreciable quantities of smoke. The quantity and density are dependent upon the type of steel, oxygen pressure, and the efficiency of slag water jets. Hoods are placed over the scarfing roll table to collect the fumes which contain solids consisting mainly of iron oxides with traces of the alloying elements found in the steel being scarfed. The solids are submicron in size, and are produced at an approximate rate of 36 grains per pound of product surface metal removed.

The exhaust gases are comprised mainly of air with some quantities of CO and CO_2 (2%). These gases are saturated at a temperature of 60°C (140°F) when exiting the scarfer hood. Because these gases are saturated, three types of gas cleaning equipment systems are generally used:

1. Wet Precipitator - Intermittent Spray Wash
2. Wet Precipitator - Continuous Wash
3. High Energy Venturi Scrubber

The wet precipitator - intermittent spray wash uses a spray water wash on a timed cycle to cleanse the fume residue which is collected dry on the precipitator plates. The wet precipitator - continuous wash, uses a continuous water wash to cleanse the collected fume residue from precipitator plates. The high energy scrubber requires 45 to 50 (inches water column) pressure drop to clean the gases, and requires scrubbing water at a rate of 7 to 12 gallons per 1000 cubic feet of saturated gas exhausted. The effluent wastes from these gas cleaning systems are generally discharged to the primary mill wastewater treatment system. At many mills, scarfer wastewaters are recycled continuously with only a blowdown discharged to the primary mill treatment system.

Many primary mills are being replaced with continuous casting operations referred to as billet, bloom or slab casting machines. The casting machines, in turn, furnish the steel slabs or blooms to the section mills.

See Figures III-2 and III-3 for primary rolling mill process flow diagrams.

Section Rolling Mills

The section rolling mill uses the semi-finished product from the primary mill as a raw material and produces either an intermediate finished product called a billet, which is further reduced in other finishing mills, or rolls the bloom directly to a finished product. Most billets are rolled directly from the primary mill without reheating furnaces but some steel plants employ furnaces between the primary and section mills.

Reheating is necessary for section operations whenever the temperature of the steel falls below that temperature required to maintain plasticity. Reheating furnaces are either batch or continuous. Batch furnaces are those in which the charged material remains in a fixed position on the hearth until heated to rolling temperature. Continuous furnaces are those in which the charged material moves through the furnace and is heated to rolling temperature as it progresses toward the exit. Batch furnaces vary in size from those with hearths of only a few feet square to those 20 ft in depth by 50 ft long. Some modern continuous furnaces have hearths 80 to 90 feet long.

Automatic hot scarfing is used at five section mills. The automatic hot scarfer used for the section mill operations is the same as described for primary rolling mills.

The intermediate and finished products produced from section mills include rails, joint bars, I-beams, channels, angles, wide flanged beams, H-beams, sheet piling, and billets which are further processed into tube rounds, bar and rod, wire, and numerous special sections. Following is a brief description of the various section mills.

Billet Mills

There are several types of billet mills. One is the three high mill with lifting and tilting tables. This mill consists of three rolls mounted on a single roll housing stand, one roll above the other. Billets are rolled in one direction between the bottom and middle rolls and in the opposite direction between the middle and top rolls. The lifting and tilting tables move the billets to the two different pass levels. Mills of this type can produce only a limited number of product sizes.

Another billet mill design is the cross-country mill which is composed of several roll stands so arranged that the billet is never in more than one stand at the same time. The roll stands may be placed side by side and the billet transferred to the various roll tables. The direction of rolling can be reversed in each stand. The cross country billet mill is faster and more flexible than the three high mill and can roll a wide range of billet sizes.

A third billet mill design is the continuous billet mill in which a series of roll stands continuously reduce the billet in size, rolling in only one direction through the mill stands. Continuous billet mills have high production rates and minimal scrap losses since blooms of any length can be rolled.

Following the billet mill operation, the product is cut to the desired finished piece length. The cutting is accomplished by stationary shears, movable gang shears, flying shears, flame cutting, or saws.

Shears are faster but distort product ends while flying shears are used on small billets to eliminate long tables and transfers. Saws and flame cutting eliminate distorted ends but are slower and require maintenance and expensive fuels.

The billets are subsequently transferred to bar mills or merchant mills for processing into finished products. The billets are heated to rolling temperature in continuous reheat furnaces where they are fed into one end and moved through the furnace by a billet pusher. A walking beam furnace is sometimes used to eliminate the slide marks on the underside of the billets. A billet ejector, normally a pusher bar type, pushes the end billet out of the side of the furnace. A shear then cuts the heated billets to size or removes bent ends prior to conveying the billet to the bar mill.

Bar Mills

Modern bar mills are normally arranged in a cross-country design or continuous design. Both types have in-line roughing stands, however, the cross-country mill has side by side intermediate and finishing stands whereas the continuous mill has all stands in-line. The continuous mill is more efficient for production runs but requires more space and individual motors on each stand. Descaling and cooling water sprays are employed at the mill stands with the discharge draining to trenches under the mill into collection systems.

Various products are rolled in the bar mills such as angles, channels, flats, other small sections, rebar, window sash, fence posts, rounds, wire, and flat narrow strips. These products are sheared to proper length, marked for identification, sometimes straightened, bundled or coiled, and weighed for shipment or further processing.

Rail Mills

Rails are formed from heated blooms in various mill arrangements, but the forming generally takes place in three steps or stages. The first stage is the roughing stage where the bloom is reduced in cross section and elongated. High pressure sprays are used at the discharge of the roughing stands for scale removal. The second, or intermediate stage, proceeds with the forming of the rail and involves a combination of slabber, dummy, former, edger, and leader passes, depending upon the mill layout. The third stage is the finishing pass which then completes the formation of the desired rail section.

The rails are conveyed from the finishing stand on a runout table to hot saws which cut the product to the standard 39 ft. rail length or, at modern mills, to 80 ft. After sawing, the rails are stamped, cambered, and weighed before they are advanced to cooling beds. Rails intended for railroad service must be control cooled in containers to prevent the formation of internal thermal ruptures or cracks. After cooling, the rails are conveyed to finishing operations which consist of inspection, removal of saw burrs, straightening, drilling, grinding of ends, leveling, inspection, classification, and painting.

Rail-Joint Bars

Joint bars are rolled from heated blooms or billets similar to rails. Additional passes are required if the joint bar has a depending flange, or long toe. The finishing operation consists of hot-working and oil-quenching the joint bars. In this operation, the product is cold sheared to length and then reheated for hot-working which consists of punching, slotting, straightening, and quenching in an oil tank.

Structural and Other Section Mills

Structural sections include standard items such as I-beams, channels, angles, and wide-flange beams, and special sections such as zees, tees, bulb angles, and car-building center sills. Other sections include miscellaneous shapes such as sheet piling, tie plates, and cross ties.

Blooms are heated in a continuous reheat furnace and then conveyed to the roughing, intermediate, and finishing stands. Passes in actual use range from fifteen roughing and nine intermediate on sections requiring heavy overall work, to two fine roughing and three intermediate on the sections requiring a minimum of work. In all cases, the intermediate passes are followed by a single finishing pass. In rolling wide-flange beams it is customary to roll a bloom which has, as nearly as possible, the same proportions as the finished beam.

Rolled material from the structural mills is delivered by a roller table to the hot saw. This equipment consists of a circular saw over which large quantities of cooling water are passed to maintain the cutting edges. Cuts are usually made at the hot saw to remove the crop ends, to part the usable material into lengths that can be handled for further processing, and to provide short test pieces. The shapes are then cooled on a cooling bed. After cooling, the shapes are conveyed to the finishing area where they are straightened, cold sheared or cold sawed, and inspected prior to separating and assembling for shipment.

Merchant-bar, rod, and wire mills produce a wide variety of products in continuous operations ranging from shapes of small size through bars and rods. Mill designation and product classification are not well defined within the industry. In general, the small cross-sectional area and long lengths distinguish the products of these mills. Raw materials for these mills are reheated billets. Many older mills included hand looping operations in which the material is passed from stand to stand manually. Newer mills use mechanical methods of transferring the material from stand to stand. As with other rolling operations the billet is progressively squeezed and shaped to the desired product dimensions in a series of rolls. Water sprays are used throughout the operation to remove scale.

See Figure III-4 for the process flow diagram for section rolling mills.

Flat Rolling MIlls

Plate Mills

Plates are classified according to size limitations to distinguish them from sheet, strip, and flat bars. According to this classification, plates are generally considered to be those flat hot-rolled finished products that are more than 8 inches wide and generally 0.23 inches or more thick, or over 48 inches wide and at least 0.18 inches thick. The sequence of operations for plate mills is reheating of slabs, descaling, rolling, leveling, cooling and shearing. Most plate mills use continuous heating furnaces. Descaling in modern plate mills is accomplished by hydraulic sprays impinging on both top and bottom surfaces and operating at pressures up to 1,500 lbs per sq. in. Temperature variation in the plate from the front to the back is a problem of particular importance in rolling plates, as is the care that must be exercised in cooling the rolled product so as to avoid distortion.

The basic operation of a plate mill is the reduction of a heated slab to the weight and dimensional limitations defining plates. Slabs are received from slabbing mills or continuous casters and then stored in slab yards. Slabs are removed from storage by overhead cranes and placed on a charging table at the entry end of the reheat furnaces. The slabs are moved through a continuous type reheat furnace by pushing the last piece charged with a pusher at the entry end of the furnace. The reheat furnace heats the slabs to a rolling temperature of approximately 1,220°C (2,230°F). As each cold slab is pushed into the furnace against the line of material already in the furnace, a heated piece exits the furnace. The heated slab is discharged from the furnace by gravity upon a roller table which feeds the mill.

Heated slabs are conveyed on a roller table to a scale-breaker stand. As the slab leaves the scale-breaker, primary descaling is completed with top and bottom high pressure water sprays operating at 1,000 psi to 1,500 psi. The scale-breaker and water sprays flush away iron oxide or mill scale which forms on the surface of the hot slabs. Generally, about 4% of the spray water evaporates and the balance is discharged through a trench under the mills to a mill scale and wastewater collection system. Mill scale may amount to 1.5-4% of the steel production. During rolling operations, cooling water is sprayed externally over the table and mill stand rolls. Additional lubrication between product and mill stand rolls is provided at intervals by sprays of water soluble oil.

The descaled slabs are conveyed on roller tables to the plate mill. There are various types of plate mills such as three high mills, four high reversing mills, tandem mills, semi-continuous and continuous mills. Cooling water, spray water, and water soluble oil is sprayed externally over the mill stand rolls. Hydraulic sprays on both sides of the mill stands, operating at high pressure, are employed for top and bottom secondary scale removal. The plates are conveyed on a run-out table to a leveler. A portion of the run-out table is equipped with a series of cooling sprays. After leveling, the plates are cooled uniformly to avoid localized stresses which would set up permanent distortions. After cooling, the plates are conveyed to end and side shears where they are cut to proper size, transferred to a shipping or storage building, or sent to heat treating furnaces.

More information on plate mill operations is presented in Figure III-5.

Hot Strip Mill

The continuous hot strip mill uses slabs that are reheated to rolling temperatures (2000-2400°F) in continuous reheat furnaces. Slabs are provided either from a storage yard or are delivered hot directly from the slabbing mill, thus bypassing the reheat furnaces. Slab casting machines are also used to produce slabs. Slabs are generally provided in sizes of 2 to 7 inches thick, one to five feet in width and, more than twenty feet in length.

The basic operation of a hot strip mill is the reduction of slabs to flat strip steel in thicknesses of 0.04 inches to 1.25 inches, widths of 24 inches to 96 inches, and lengths up to 2,000 feet. The modern hot strip mill produces a product which may be up to 96 inches wide, although the most common width in newer mills is 80 inches. The product of the hot strip mill may be sold as produced, processed in cold reduction mills, plated or coated.

The continuous hot strip mill rolling train consists of a scale breaker stand, several roughing stands, a finishing scale breaker several finishing stands, a run-out table and coilers. Motor driven rolls convey the hot slabs from the reheat furnaces to the mill stands and also from mill stand to mill stand. If the mill is to produce strip or sheets greater than the maximum width of available slabs, the first roughing acts as a broadside mill stand in which the width of the slab is increased in a single pass by cross rolling. Turntables ahead and following the roughing stand rotate the slab 90° for cross-rolling. The roughing roll stands are separated from the finishing roll stands by a holding table while the finishing stands are a closely grouped, tandem rolling train of scale breakers and finishing mill stands. High pressure (500-1500 psi) water sprays used to remove scale from the hot slabs are located after the two scalebreaker stands and the roughing stands. Roll stand spray cooling water is provided for cooling of each roll in the stands.

Following the last finishing stand, there is usually a flying shear for cutting the rolled product into sheets. A flying shear moves with the strip as it cuts the strip into sheets. As the hot strip exits the last finishing stand it is carried over long tables called run-out tables. Mill speeds approximate 600 meters/minute (1970 feet/minute). Two or more coilers, which are located at the end of the run-out tables, serve to coil the hot strip when continuous long lengths are required. If sheets are being cut by the flying shear, the coilers do not operate. Instead, the steel sheets pass over the coilers onto a sheet piler at the end of the run-out tables.

An alternate arrangement of a hot strip mill uses reversing roughing stands with tandem continuous finishing roll stands. This arrangement allows for more passes in one roughing stand, thus decreasing the length of the mill. However, mill production capacity is less than the tandem mill arrangement.

A rotary crop shear is located between the roughing and finishing mill stands so that the front and rear ends of the strip can be squared off before finishing. Scrap strip steel from the hot strip mill is known as "cobble."

Strip product is conveyed from the finishing stands to a run-out table with automatic spray water coolers. The cooling water sprays continuously cool the product on the run-out tables. As does wastewater from the mill stands and tables, the spray water drains through a trench under the mill stands to the wastewater collection system. The coiled strip product is conveyed to storage for shipping or further processing.

More information on hot strip mill operations is presented in Figure III-6.

Combination Sheet, Strip and Plate Mills

Several hot forming-flat rolling mills produce a variety of finished products including sheet, strip and plate. Product classification is based upon thickness and width as shown below:

	Thickness Greater Than		
Width	0.05"	0.18"	0.230"
6"-12"	Strip	Strip	Plate
12"-48"	Sheet	Sheet	Plate
Over 48"	Sheet	Plate	Plate

Some mills are capable of producing all of the above products. Because of the similarities between combination mills and strip mills, the combination mills have been included in the hot strip mill data base for the purpose of developing effluent limitations.

Pipe and Tube Mills - Hot Worked

Butt-Welded Pipe

Welded tubular products are classified as butt-weld. Butt-weld pipe or tube is made from a hot rolled strip, with square or slightly beveled edges, called skelp, the width of which corresponds to the circumference of the pipe, and the gauge to the wall thickness. By heating skelp to its welding temperature in a reheat furnace and drawing it through a die or roll, the skelp is bent into a cylindrical shape and its edges pressed firmly together into a butt-weld, thus forming a pipe. The butt-welding process is used to manufacture pipe, 1/8 inches to 4 inches in diameter. Skelp is conveyed from storage and charged into a reheating furnace, welded in a welding stand, and finished on finishing machines.

The skelp is charged into a continuous reheat furnace. Modern mills use skelp strip in coils to feed continuous butt-welding operations. The skelp is fed into a threading machine which feeds it through the furnace. Once the leading end is in the forming and welding unit, the threading rolls release the skelp. The leading end of the next skelp strip is welded to the trailing arm of the first strip by a flash type skelp welder, prior to entry into the reheat furnace. The skelp strip exits from the furnace into a continuous forming and welding mill. The forming stand rolls force the skelp into a welding stand, where the edges are pressed firmly together. The last stands of the mill contain reducing rolls which provide for reduction of diameter and a resultant change in wall thickness. A rotary flying saw cuts the continuous pipe into lengths. The cut lengths are reduced to the required hot size on a sizing mill. The hot pipe is delivered to a cooling bed and then passes to a water bosh tank for fast cooling. Conveyors feed the pipe to straighteners in the finishing bay. Details of a typical operation are depicted in Figure III-7.

Seamless Tubular Products

Seamless tubular products are made by two processes; piercing and cupping. In the piercing process, a solid round bar or billet is heated, pierced and afterwards shaped to the desired diameter and wall thickness. This process is used today for most seamless pipe products. The cupping process is used primarily for the manufacture of special tubes and gas cylinders. A circular sheet or plate is forced by successive operations through several pairs of conical dies until the plate takes the form of a tube, or cylinder with one end closed. Details of a typical mill are shown in Figure III-8.

The production of seamless pipe and the mills required for this operation vary depending on the diameter of the product pipe. The steps required to produce pipe up to 4 inches in diameter consist of heating a solid billet, piercing, plug rolling, reeling, reheating and reducing or sizing. The production of pipe up to 16 inches in diameter is similar except a second piercing and reheating operation is required. Pipe up to 26 inches in diameter is produced in a manner similar to the preceding 16 inch operation except for the addition of a rotary rolling mill and a third reheating operation.

A solid bar or billet of the proper length and diameter to make the size and weight of the tube desired is heated to rolling temperature of approximately 1,230°C (2,250°F). The heated billet is transferred in a horizontal trough to the piercing mill, which consists of two contoured horizontal rolls and a piercing mandrel. The roll surfaces are contoured so that, in the horizontal plane through the centerline of the pass, the space between the rolls converges toward the delivery side and then diverges to form the pass outlet. The point of the centerline of the pass is determined by guides between the rolls. Between these guides in the pass outlet, a projectile shaped piercing mandrel is held in position on the end of a water-cooled mandrel support bar, located on the delivery side of the mill. The heated billet is drawn over a mandrel, thus forming a hollow shell. As the billet is drawn and compressed, the spreading of the metal sets up a lateral tension which may cause its particles to be drawn away from the center, and for this reason the nose of the mandrel is at a point preceding the forming of the cavity to insure a smooth inner surface. The initial piercing produces a hollow tube with a comparatively heavy wall. The second piercing mill further reduces the wall thickness and increases the diameter and length of the piece required in the production of large diameter product.

In the plug mill, a plug on a support bar is rammed into the end of the shell, which is then drawn over the plug by revolving rolls, slightly reducing its wall thickness and increasing its diameter and length. In the rotary rolling mills, which are used for large diameter pipe, conical rolls grip and spin the pipe, feeding it forward over a large tapered mandrel, thereby decreasing the thickness of the pipe wall and increasing its diameter. The length of the tube remains essentially unchanged by this operation.

The reeling machine, consisting of rolls and a mandrel similar to the piercing mill, reduces the thickness of the wall slightly. This reduction has the effect of burnishing the inside and outside surfaces of the tube and slightly increasing its diameter. After reeling, the tube is reheated and conveyed to the sizing rolls, the grooves of which are slightly smaller than the reeled tube. This reduces the tube diameter which insures uniform size and roundness throughout its length. After sizing, the product is straightened, its ends cropped, inspected, and finished as required for its eventual use.

The properties of hot rolled seamless pipe may be improved by cold working. One method is the seamless pipe method in which the hot rolled pipe (after cooling) is conveyed to a cold expander mill. The hot rolled pipe is dropped into an expander trough, clamped with one end held firmly against a backstop. A long ram is positioned at the opposite end of the pipe and an expander plug is forced through the pipe under extreme pressure. The plug is lubricated through the ram head with a water soluble oil. After cold expansion, the seamless pipe enters a rotary straightener after which it is hydrostatically tested. Cold working the pipe increases its yield strength and generally improves the product. The cold worked operations are included in the cold forming subcategory.

TABLE III-1

SUMMARY OF SAMPLED PLANTS
HOT FORMING SUBCATEGORY

Sample Code	Plant Reference Code	Type of Mill	Steel Type
		PRIMARY MILLS	
E	0020B	Slab	Specialty
L-2	0060	Slab	Carbon
282A	0088D	Bloom	Specialty
A-2	0112B(01 & 02)	Bloom Mills (2)	Carbon
B-2	0112B(03)	Slab	Carbon
081	0176	Bloom	Specialty
R & 285A (Revisited)	0240A	Bloom	Specialty
H	0248A	Bloom	Specialty
D	0248B	Slab	Specialty
K	0256K	Slab/Bloom	Specialty
0286A	0432C	Slab	Carbon
M	0432J	Slab/Bloom	Specialty
082(1)	0496(140"only)	Slab/Rough Plate	Carbon
082	0496(140",206" in tandem)	Slab/Rough Plate	Specialty
288A	0584F	Bloom	Carbon
289A	0684B	Bloom	Carbon
Q	0684D	Bloom	Specialty
C-2&088(Revisited)	0684H	Bloom	Carbon
290A	0856R	Slab/Bloom	Carbon
291	0856B	Slab	Carbon
293A	0856N	Slab/Bloom	Carbon
083	0860H(03)	Slab/Bloom	Carbon
294A	0920N	Bloom	Carbon
D-2	0946A	Bloom	Carbon
		SECTION MILLS	
A-2	0112B(03)	Rail Mill	Carbon
D-2	0291C	Nos.2,5 and 6 Mills	Carbon
E-2	0196A(09&10)	Bar Mill & Rod Mill	Carbon
F-2	0384A(06)	12" Bar Mill	Carbon
G-2	0640A(01&02)	10"&12" Mills	Carbon
H-2	0432A(04)	Rod Mill	Carbon
I-2	0856O	Rod Mill	Carbon
C	0424(01-03)	Bar Mills(3)	Specialty
H	0248A	Merchant Mill	Specialty
K	0256K	Bar Mill	Specialty
M	0432J	Billet Mill	Specialty

TABLE III-1
SUMMARY OF SAMPLED PLANTS
HOT FORMING SUBCATEGORY
PAGE 2

Sample Code	Plant Reference Code	Type of Mill	Steel Type
O & 081(Revisited)	0176(01-04)	Bar Mills(3)	Specialty
O	0176(04)	Wire/Rod Mills	Specialty
Q	0684D	Bar Mill	Specialty
R & 285B(Revisited)	0240A(01)	Bar Mill	Specialty
R	0240A(02)	Bar Mill	Specialty
083	0860H(02&03)	34" & Rod Mills	Carbon
087	0432A(02)	14" Mill	Specialty
088	0684H(02)	34" Mill	Specialty
088	0684H(01,03,05,06,07)	36",32",14",10",11" Mills	Carbon
282B	0088D	22" Bar Mill	Specialty
283	0112(01,02,03,06,10)	18",32",42",48", Combination Mill	Carbon
290B	0856R	#5 Bar Mill	Carbon
293B	0856N(01,02)	10"/12" Bar Mill	Carbon
		HOT STRIP & SHEET MILLS	
O	0176	#4 Hot Mill	Specialty
E & 281(Revisited)	0020B	HSM	Specialty
D	0248B	HSM	Specialty
J-2 & 292(Revisited)	0860B(01)	84" HSM	Carbon
L-2	0060	Hot Strip & Sheet Mill	Carbon
M-2	0384A(02)	80" HSM	Carbon
N-2	0396D(02)	#4 HSM	Carbon
086 & 284A(Revisited)	0112D(02)	80" HSM	Carbon
087	0432A	44" HSM	Carbon
286B	0432C	80" HSM	Carbon
287	0584B	80" HSM	Carbon
288B	0584F	54" HSM	Carbon
289B	0684B	56" HSM	Carbon
294B	0920N	80" HSM	Carbon
		PLATE MILLS	
F	0856H(03)	160" Plate Mill	Specialty
K-2	0868B	160" Plate Mill	Carbon
082	0496(01&03)	140",112"/120",and 140"/206" Mills	Carbon
082	0496(02&04)	112"/120" and 140" Mills	Specialty
083	0860H(01)	30" Plate Mill	Carbon
086 & 284B(Revisited)	0112D(01)	160" Plate Mill	Carbon

TABLE III-1
SUMMARY OF SAMPLED PLANTS
HOT FORMING SUBCATEGORY
PAGE 3

Sample Code	Plant Reference Code	Type of Mill	Steel Type
		PIPE & TUBE MILLS	
E-2	0196A(01)	Seamless	Carbon
GG-2	0240B(05)	Seamless	Specialty
II-2	0916A	Butt Weld	Carbon
JJ-2	0728	Butt Weld	Carbon
KK-2	0256G	Butt Weld	Carbon
087	0432A(01)	Butt Weld	Carbon
088	0684H	Seamless	Carbon
293C	0856N	Seamless	Carbon
295	0948A	Seamless	Carbon

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(1) Plant 082 consists of a 206" and a 140" set of mill stands which are part of the same line, and can work as a single unit or as separate mills. The line was sampled while operating in two different configurations as shown. This same complex also functions as a Hot Forming - Flat/Plate Mill.

TABLE III-2

GENERAL SUMMARY TABLE
HOT FORMING-PRIMARY

Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity Tons/Day	Flows in Gallons/Ton			Treatment Components		Operating Mode	Discharge Mode	Machine Scarfing
					Applied	Process	Discharge	Process Treatment	Central Treatment			
0020B	Slabs	SS & Elects	1948	4065	[1594]	[1594]	[1594]	PSP	SSP,SS,SC	OT	Direct	No
0060	Slabs	C.S.	1969	8537	2024 (1012)	1012	210	PSP,SS,	CNT,FLL, FLF,CL, CT,VF	RUP-50 RET-10 RTP-39.6 BD-0.4	Direct	Yes
0060B 01	Slabs	C.S.	1953 [1966]	5505	IR	IR	IR	IR	(CT)	RTP(UNK) RET(UNK)	Indirect	No
0060B 02	Blooms	C.S.	1964	1653	IR	IR	IR	IR	(CT)	RTP(UNK) RET(UNK)	Indirect	No
0060D	Blooms, Slabs	Elect. Steel	1910 [1958]	2268	254	254	4	PSP	SSP,FLL, FLA,CL SL	RTP-99 BD-1	Direct	No
0060F 01	Slabs & Blooms	C.S.	1962	6195	2045	232.4	UNK	PSP,SSP, SC,SL SS	-	RUP-89 RTP-UNK BD-UNK	Direct	Yes
0060F 02	Blooms	C.S.	1944	2070	IR	IR	IR	IR	-	UNK	Direct	Yes
0060G	Blooms	C.S.	1954	2868	4895 (1004)	4895	685	PSP,SL SS,SCR	-	RUP-86 BD-14	Direct	Yes
0060I	Blooms	SS	1941	495	3782	3782	0	PSP	SSP,CT, SS	RET-100	Indirect	No
0068	Blooms	C.S.	1905 [1966]	1407	IR	IR	IR	IR	-	RTP(UNK)	POTW	Yes
0088A	Blooms	SS	1942 [1958]	180	Zero	Zero	Zero	IR	(VF),(FP)	(RTP)	N/A	No
0088D	Blooms	HSLA	1959	2058	[5050]	[25]	[25]	-	NL,FLP, CL,SS,VF	[RUP-99.5 BD-0.5]	Direct	Yes
0112 01	Blooms	C.S.	1907 [1955]	3966	IR	IR	IR	PSP,SSP, SS	CNT FDS	OT	Direct	No

TABLE III-2
GENERAL SUMMARY TABLE
HOT FORMING-PRIMARY
PAGE 2

Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity Tons/Day	Flows in Gallons/Ton Applied	Flows in Gallons/Ton Process	Flows in Gallons/Ton Discharge	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode	Machine Scarfing
0112 02	Blooms	C.S.	1907	3633	IR	IR	IR	PSP,SSP, SS	CNT FDS	OT	Direct	No
0112 03	Blooms	C.S.	1917			NOT IN OPERATION						
0112 04	Blooms, Slabs	HSLA	1914	870	IR	IR	IR	-	PSP,SSP SS,CF FDS	RUP(UNK) RTP(UNK) BD(UNK)	Direct	Yes
0112A 01	Slabs & Blooms	C.S.	1926 [1954]	4641	1179	559	559	PSP	CNT,NL,FLA, FLP,SL	BD-47 RUP-53	Direct	Yes
0112A 02	Slabs	C.S.	1930	6861	336	336	336	PSP,SSP SS	CNT F	RET-100	Indirect	Yes
0112A 03	Slabs	C.S.	1957	10,035	2296	574	574	PSP,SS, SCR	CNT,NL, FLA,FLP, SL	RUP-75 BD-25	Direct	Yes
0112B 01	Blooms	C.S.	1926 [1952]	1971	IR	IR	IR	PSP,(SS)	F,(CLR)	RTP(UNK)	Direct	No
0112B 02	Blooms	C.S.	1928	3963	IR	IR	IR	PSP,(SS)	FDS, T,(CLR)	RTP(UNK)	Direct	Yes
0112B 03	Slabs	C.S.	1961	10,974	IR	IR	IR	PSP,(SS)	FDS(UNK),(CLR)	RTP(UNK)	Direct	Yes
0112D	Slabs	C.S.	1969	11,619	IR	IR	IR	PSP,SSP, SS	CNT,FLP, NL,CL, SL NW	RTP(UNK)	Direct	Yes
0112E	Blooms	C.S.	1914 [1954]	4515	IR	IR	IR	PSP,SS	CNT SSP,SL	RUP(UNK) (RTP)	Direct	No
0112F	Slabs & Blooms	C.S.	1947	1857	IR	IR	IR	PSP,SS	CNT CL,SSP,CT	RUP(UNK) RTP(UNK)	Direct	Yes

TABLE III-2
GENERAL SUMMARY TABLE
HOT FORMING-PRIMARY
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					Flows in Gallons/Ton			Treatment Components				
Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity Tons/Day	Applied	Process	Discharge	Process Treatment	Central Treatment	Operating Mode	Discharge Mode	Machine Scarfing
0112G	Slabs & Blooms	C.S.	1958	1575	IR	IR	IR	PSP,SS	CNT SSP	RTP(UNK)	Direct	No
0176	Blooms	UNK	1917/18 1969	285	[760]	[760]	[51]	PSP	TP,CL,CT	RTP-96 BD-4	Direct	No
0188A	Blooms	C.S.	1959	825	5585	5585	5585	PSP,SS	SSP,FDS	OT	Direct	No
0188B	Blooms	C.S.	1940 1961	804	3656	3656	1846	PSP	SSP,CT	RTP-49.5 RET-49.5 BD-1	Direct	No
0196A 01	Rail Billets	**	**	**	**	**	**	**	**	**	**	
0196A 02	Slabs & Blooms	**	**	**	**	**	**	**	**	**	**	
0240A	Blooms	HSLA	1942 1957	2322	[2320]	[2320]	[266]	PSP	SSP SL,SS,(FP)	RTP 88.5	Direct	Yes
0248A	Blooms	AT	1912 1958	2433	4735	4735	459	PSP	SCR, SSP,SS	RTP-90.3 BD-9.7	Direct	Yes
0248B	Slab	SS	1960	1500	7776	7776	96	PSP	SSP, SCR,FLP CL,SS,CT	RTP-98.8 BD-1.2	Direct	Yes
0248C	Blooms	SS	1962	415	2186	2186	146	PSP	A,NC,FLF FLP CL	RTP-93.3 BD-6.7	Direct	No
0256C	Slabs	C.S.	1952 1966	2526	IR	IR	IR	PSP	SL,SS	RTP(UNK)	Direct	No
0256K	**	**	1973	**	**	**	**	-	**	**	**	
0320 01	Blooms	Alloy	1936	1500	IR	IR	IR	PSP	SS NC,GC,CL SL	OT	Direct	No

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Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity Tons/Day	Flows in Gallons/Ton Applied	Flows in Gallons/Ton Process	Flows in Gallons/Ton Discharge	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode	Machine Scarfing
0320 02	Slabs	C.S.	1969	9600	2175	1800	375	PSP	NC,SS, GC,CL, SL	RUP-83 BD-17	Direct	Yes
0384A 01	Slabs & Blooms	C.S.	1917 [1953]	3864	7483	7483	7483	PSP	SSP,SS SL	(RTP)	Direct	No
0384A 02	Blooms & Slabs	C.S.	1936 [1952]	5034	2613	2613	2613	PSP	SL SS	(RTP)	Direct	Yes
0384A 03	Slabs	C.S.	1958 [1966]	8328	1919	1919	1919	PSP	SS, SL	(RTP)	Direct	Yes
0396D	Slab	C.S.	1959	2031	IR	IR	IR	PSP,SS		(RTP) RUP(UNK) RET(UNK)	Indirect To POTW	No
0396E	Slabs	C.S.	1941	1419	4465	4465	2103	PSP	SL	RTP-52.9 RET-38 BD-9.1	Direct	No
0424	Slab, Blooms	SS	1971	450	800	800	160	-	FDS SL,CT PSP,SS,SSP	RTP-80 BD-20	Direct	No
0430C 01	Slabs	SS	1962	90	288	288	288	-	SCR,BIO NL,FLL,CL FLP,SS,CLA SL	OT	Direct	No
0430C 02	Sheet Bar Mill	C.S.	1920 [1958]	114	1655	1655	1655	-	SCR,BOA, NL,FLL,FLP, CL,SS,CLA, SL	OT	Direct	No
0432A	Blooms	C.S.	1909 [1953]	5724	IR	IR	IR	PSP	FLP,FLM, CL,SS,SCR, VF	(RTP)	Direct	Yes
0432B	Blooms & Slabs	C.S.	1952	5703	IR	IR	IR	PSP,SS,(FP)	-	OT	Direct	Yes
0432C	Slabs	C.S.	1957 [1967]	10,119	[2190]	[1145]	[301]	PSP,SS	VF,FLL,FLP, NW,CL, CT	[RUP-47.7 BD-13.7 RTP-38.6]	Direct	Yes

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Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity Tons/Day	Flows in Gallons/Ton			Treatment Components		Operating Mode	Discharge Mode	Machine Scarfing
					Applied	Process	Discharge	Process Treatment	Central Treatment			
0432J	Bloom Slab	SS	1950	1089	IR	IR	IR	PSP,SSP	-	OT	POTW	No
0440A	Slab, Bloom	SS	1967	387	27,163	0	0	PSP,SSP SS	-	RTP-100	Zero Discharge	No
0448A 01	Blooms & Slabs	C.S.	1944 [1954]	1938	IR	IR	IR	PSP,SSP, CL,SL, CT	-	RTP(UNK)	UNK	No
0448A 02	Slabs	C.S.	1858	6636	IR	IR	IR	PSP,SSP CL,SL CT	-	RTP(UNK)	UNK	Yes
0460A	Blooms	C.S.	1917 [1956]	1242	6145	5913	3853	PSP	SCR,SL SSP,SS	RTP-37.3 RET-62.7	Indirect	Yes
0476A	Blooms & Slabs	C.S.	1915 [1940]	1699	3273	382	382	PSP	FLP,NL,A SCR,CL, SL,SS	RTP-88.3 BD-11.7	Direct	No
0492A	Slab	C.S.	1953	3714	1551	1551	1551	PSP,SSP	SL,SS	RET(100)	Indirect	No
0496	Slabs & Blooms	C.S.	1959 [1968]	2415	[460]	[460]	[460]	PSP	SSP,SS,FLP, FDS	OT	Direct	Yes
0528A	Blooms & Slabs	C.S.	1949	5550	2128 (1038)	2128	2128	PSP	SSP,CO,EB, FLP,NL,SCR, CL,T,SS	OT	Direct	Yes
0584A 01	Blooms	C.S.	1930 [1958]	4605	1873	1873	1873	PSP	SSP,SS	OT	Direct	Yes
0584A 02	Slabs	C.S.	1953	9888	1456	1456	1456	PSP	SSP,SS	OT	Direct	Yes
0584C	Slabs	C.S.	1953	8718	344	344	344	PSP,SS	SS,SL, FDS,CLB	(RTP)	Direct	No
0584F	Slabs & Blooms	C.S.	1920 [1962]	7041	[820]	[820]	[320]	PSP	SL,(VF),(FP) SS	OT	Direct	Yes

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Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity Tons/Day	Flows in Gallons/Ton			Treatment Components		Operating Mode	Discharge Mode	Machine Scarfing
					Applied	Process	Discharge	Process Treatment	Central Treatment			
0612 01	Slabs & Blooms	C.S.	1952	3312	3913	3913	78	PSP	SSP, SL,CT, SCR,SS,FDS	RTP-98 RET-2	Indirect	No
0612 02	Slabs & Blooms	C.S.	1974	2631	4926	4926	98.5	PSP	SSP, SL,CT, SCR,SS,FDS	RTP-98 RET-2	Indirect	No
0640	Blooms	C.S.	1914 [1938]	1878	4332	1265	1265	PSP	FDS,SL	RUP-70.8 BD-29.2	Direct	No
0652A	Blooms	C.S.	1906 [1952]	795	1087	1087	1087	PSP	FLL,FLA, NL,NC, SSP,SS,CT	OT	Direct	No
0672B	Bloom	HSLA	1952	453	6517	1272	1272	PSP	-	RUP-80 BD-20	POTW	No
0684A	Slabs & Blooms	C.S.	1910 [1957]	4851	742	742	742	PSP,SS	-	OT	Direct	No
0684B	Blooms	C.S.	1917 [1973]	4905	[1050]	[1050]	[1050]	PSP,SSP, SS	-	OT	Direct	No
0684D	Bloom	Alloy Steel	1915			NOT IN OPERATION		SL,SS	-	-	-	No
0684E	Slab, Bloom	Alloy Steel	1916 [1927]	2520	857	857	857	PSP,SSP, SS,FLC, CL,CT	-	OT	Direct	No
0684F 01	Slabs & Blooms	C.S.	1937	1752	6164 (2466)	6164	6114	PSP	SSP,SS, SCR,FLL,FLP FLC,FDS VF	BD-99.2 RTP-0.8	Direct	Yes
0684F 02	Slabs	C.S.	1956	7110	1985	1965	1965	PSP	SSP,SCR FLL,FLP,FLC, FDS,VF	RTP-0.8 BD-99.2	Direct	Yes
0684G	Slabs & Blooms	C.S.	1916 [1951]	2208	2400	2048	1839	PSP	SSP,SCR, FLL,FLP, FLC,CL, FDS,VF	RUP-14.7 BD-76.6 RET-8.7	Direct	Yes

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Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity Tons/Day	Flows in Gallons/Ton Applied	Flows in Gallons/Ton Process	Flows in Gallons/Ton Discharge	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode	Machine Scarfing
0684H	Blooms	C.S.	1943	5565	[1700]	[1700]	[5]	PSP	CL, FDS	[RTP-99.7 BD-0.3]	POTW	Yes
0684I	Slabs & Blooms	C.S.	1930	5517	679	679	360	PSP	SSP, SS,BOA, NW,SL	BD-52.9 RTP-47.1	Direct	No
0724A	Slabs & Blooms	C.S.	1957	4152	4162	867	867	PSP,FLP		RUP-79.2 BD-20.8	Direct	Yes
0784	Bar	C.S.	**	**	**	**	**	**	**	**	**	**
0796A	**	**	1924	**	**	**	**	**	**	**	**	
0856F	Slabs	C.S.	1952	12,612	1827	1370	1370	PSP	GF, FLP,BOA, SL,SS	RUP-25 BD-75	Direct	Yes
0856H 01	Slabs, Blooms, & Axles	C.S.	1926	1872	2725	2725	2725	PSP	SSP,SS, (FP), (CT)	(RTP)	Direct	No
0856H 02	Slabs, Blooms, & Rounds	C.S.	1926	1830	2787	2787	2787	PSP	SSP,SS, (FP), (CT)	(RTP)	Direct	No
0856H 03	Slabs	C.S.	1944	8916	727	727	727	PSP	(FP), (CLR), (CT)	(RTP)	Direct	Yes
0856N	Slabs & Blooms	C.S.	1949	7905	[2250]	[1040]	[1040]	PSP	SS, SL	[RUP-46 BD-54]	Direct	Yes
0856Q 01	Blooms	C.S.	1908 [1955]	3195	IR	IR	IR	PSP	SL SS	OT	Direct	No
0856Q 02	Blooms	C.S.	1907	1968	IR	IR	IR	PSP	SL SS	OT	Direct	No
0856R	Slabs & Blooms	C.S.	1959	5391	[6360]	[6360]	[6360]	PSP,SS,	-	OT	Direct	Yes
0856T 01	Slabs & Blooms	C.S.	1894 [1907]	4059	1281	1281	1281	PSP,SSP,SS	-	OT	Direct	No

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Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity Tons/Day	Flows in Gallons/Ton			Treatment Components		Operating Mode	Discharge Mode	Machine Scarfing
					Applied	Process	Discharge	Process Treatment	Central Treatment			
0856T 02	Slabs	C.S.	1909	2895	298	298	298	Scale Bucket	-	OT	Direct	No
0860B 01	Slabs, Blooms	C.S.	1909	2406	1915	1903	1903	PSP,SSP	SL, SS,(FP)	REU-(UNK) BD-(UNK) (RTP)	Direct	Yes
0860B 02	Slabs & Billets	C.S.	1909	3492	3464	3439	3439	PSP	SL, SS,(FP)	REU-(UNK) BD-(UNK) (RTP)	Direct	Yes
0860B 03	Slabs, Blooms & Wheels	C.S.	1918 [1953]	1260	NOT IN OPERATION							
0860B 04	Slabs & Blooms	C.S.	1931	2529	3587	3587	3587	PSP	SL SS	OT	Direct	No
0860B 05	Slabs	C.S.	1958	11,178	1095	1092	1092	PSP	SL SS	REU-0.2 BD-99.8	Direct	Yes
0860H 01	Slabs & Blooms	C.S.	1931	2988	6747	6747	234	PSP	CL,CT VF,FLL, FLA,SCR, SSP,SS,T	RTP-96.6 BD-3.4	POTW	No
0860H 02	Slabs	C.S.	1931	8490	1866	1866	65	PSP	CL,CT,VF, FLL,FLA, SCR,SSP, SS,T	RTP-96.5 BD-3.5	POTW	No
0860H 03	Slabs, Blooms	C.S.	1959	3441	[320]	[320]	[12]	PSP,SS	CL,CT, VF,FLL, FLA,SCR, SSP,SS,T	[RTP-96.3 BD-3.7]	POTW	No
0864A 01	Slabs & Blooms	C.S.	1944 [1946]	6795	1272	318	318	PSP	-	RUP-75 REU-25	Indirect	No
0864A 02	Blooms	C.S.	1976	2373	2124	303	127	PSP	CL,SS, SL	RUP-85.7 RET-8.9 BD-5.4	Direct	No
0864C	Blooms	C.S.	1928	450	1280	1280	93	PSP,SS	SL, SS,CT, CLA,EB,FLP	RTP-92.7 BD-7.3	Direct	No

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GENERAL SUMMARY TABLE
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Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity Tons/Day	Flows in Gallons/Ton			Treatment Components		Operating Mode	Discharge Mode	Machine Scarfing
					Applied	Process	Discharge	Process Treatment	Central Treatment			
0868A 01	Slabs & Blooms	C.S.	1902	3000	1236	1236	1236	PSP	SSP, SS,SL	OT	Direct	No
0868A 02	Slabs & Blooms	C.S.	1919	2340	614	614	599	PSP	SL, SSP,SS	RTP-2.4 RET-86.1 BD-11.5	Direct and Indirect	No
0868A 03	Slabs	C.S.	1939	4692	1886	965	917	PSP	SL, SSP,SS	RTP-2.6 RET-42.7 BD-5.9 RUP-48.8	Direct and Indirect	No
0920A	Slabs	C.S.	1928	5361	3465	3384	510	PSP,SSP F	-	RTP-87.6 BD-12.4	Direct	Yes
0920B	Slabs & Blooms	C.S.	1908 [1951]	5325	2382	760	760	-	PSP,SS,(CLR)	(RTP) RUP-(UNK) BD-(UNK)	Direct	No
0920N	Slabs	C.S.	1952	4545	[4310]	[4310]	[290]	PSP,SSP F	-	RTP-88 BD-12	Direct	Yes
0940	Rebar	C.S.	1967 [1975]	135	1067	1067	0	PSP	-	RUP-100	Zero Discharge	No
0946A	Blooms	C.S.	1925 [1937]	3066	1550	1409	1409	PSP	SSP,FDS, FLP,T	RUP-9 RET-91	Indirect	Yes
0948A	Slabs, Blooms,	C.S.	1931 [1951]	3909	3481 (2376)	1271	1271	PSP	-	RUP-63.5 BD-36.5	Direct	Yes
0948B	Slabs & Blooms	C.S.	1914 [1954]	3930	1905	1905	1905	PSP	-	OT	Direct	No
0948C 01	Slabs & Blooms	C.S.	1929	4461	710	710	710	PSP	SSP, SL,SS,(FP)	OT	Direct	No
0948C 02	Slabs	C.S.	1953 [1968]	7923	3908 (600)	3908	3908	PSP	SSP, SL,SS	OT	Direct	Yes

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KEY TO SYMBOLS & ABBREVIATIONS

Steel Type

AT : Alloy Tool
C.S. : Carbon Steel
Elect.: Electrical Steel
HSLA : High Strength, Low Alloy
SS : Stainless Steel
UNK : Data not provided by company

Operating Mode (Number following abbreviation indicates % of applied rate in each case)

BD : Blowdown
OT : Once-Through
RET: Reused on operations other than hot forming following treatment
REU: Reused on operations other than hot forming without treatment
RTP: Recycled to hot forming operations following treatment
RUP: Recycled to hot forming operations without treatment

Treatment Components

For a description of the treatment component codes, see Table VII-1.

Discharge Mode

Direct : Discharged from process to receiving stream.
Indirect : Reused in some other process, then eventually discharged to receiving stream.
POTW : Discharged from process to publicly owned treatment works.
Indirect to POTW: Reused in some other process, then eventually discharged to publicly owned treatment works.

Determination of Capacity Value

The capacity values for primary operations (and the other hot forming operations) were calculated by taking the average 1976 production per turn and multiplying by three.

* : Dry operation
** : Confidential Data
IR : Inadequate Response
() : Flows in parentheses indicate that a portion of the applied flow is attributable to machine scarfing. Treatment components in parentheses represent treatment systems which were installed after January 1, 1978.
: Year of most recent major rebuild. Other data in brackets was received in response to the detailed questionnaires or during the sampling visits.
N/A: Not applicable

TABLE III-3

HOT FORMING SECTION
SUMMARY TABLE

Plant Code	Products	Steel Types	Age 1st yr. of Prod.	Production Capacity Ton/Day	Flow (Gallons/Ton) Applied	Flow (Gallons/Ton) Process	Flow (Gallons/Ton) Discharge	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0060C 01	98° Gothic	CS60, LA40	1913	1320	UNK	UNK	UNK	PSP	CNT(UNK) (UNK),SSP SS, FLP	RTP(UNK) RET(UNK) BD(UNK)	Direct
0060C 02	Rounds	CS60, LA40	1913	1017	UNK	UNK	UNK	PSP	CNT(UNK) (UNK)SSP, SS, FLP	RTP(UNK) RET(UNK) BD(UNK)	Direct
0060C 03	Rounds	CS45, LA55	1913	462	UNK	UNK	UNK	PSP	CNT(2) (UNK)SSP, SS, FLP,(FF)	RTP(UNK) RET(UNK) BD(UNK)	Direct
0060F 01	I-Beams,Angles Rounds,Flatbeds Grader Blades	CS40, LA10 ABS50	1942	903	UNK	UNK	UNK	PSP	CNT(2) (UNK)SSP, SS,SCR SL(UNK)	RTP(UNK) RET(UNK) BD(UNK)	Direct
0060F 02	I-Beams,Channel Angle, Round, Flat Bar,Rebar Spigot Section Grader Blade	CS70, LA10 ABS20	1942	816	UNK	UNK	UNK	PSP	CNT(2) (UNK)SSP, SCR,SS SL(UNK)	RTP(UNK) RET(UNK) BD(UNK)	Direct
0060F 03	Round	CS45, LA15 ABS40	1944	2070	UNK	UNK	UNK	PSP	CNT(2) (UNK)SSP, SCR,SS,SL (UNK)	RTP(UNK) RET(UNK) BD(UNK)	Direct
0060F 04	Round, Square Bloom	CS55, LA15 ATS30	1950	2070	UNK	UNK	UNK	PSP	CNT(2), (UNK)SSP, SCR,SS, SL(UNK)	RTP(UNK) RET(UNK) BD(UNK)	Direct
0060F 05	WF-Beams	CS80, LA20	1971	1224	[11576]	[4988]	[59]	PSP,SSP SS FDSP CL,VF	CNT(4)(65) SL(UNK)	RUP(56.5) RTP(43) BD(0.5)	Direct
0060G 01	Billets,Rounds, Slabs	CS100	1920	2337	2342	2342	2342	PSP SS	CNT SCR,SS, SL(UNK)	OT	Direct
0060G 02	Channel, Angle, Round,Square, Flat Bar,Rebar	CS100	1948	1008	3429	3429	3429	PSP,SCR SS	CNT SCR,SS,SL SSP	OT	Direct
0060G 03	Channel, Angle, Round, Square, Flat Bar, Rebar	CS100	1921	294	12490	12490	12490	PSP, SS	CNT SCR,SS,SSP SL(UNK)	OT	Direct
0060G 04	Rebar, Rod	CS100	1959	1326	6515	6515	6515	PSP, SS,SCR	CNT SCR,SS SL	OT	Direct

TABLE III-3
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SUMMARY TABLE
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Plant Code	Products	Steel Types	Age 1st yr. of Prod.	Production Capacity Ton/Day	Flow (Gallons/Ton)			Treatment Components		Operating Mode	Discharge Mode
					Applied	Process	Discharge	Process Treatment	Central Treatment		
0060H 01	Rounds, Rebar Studded Tec	CS100	1929	1071	3025	2057	121	PSP,SS	CNT(1)(6.3) SS,SCR, SL(UNK)	RUP32,RTP64 BD4	Direct
0060I 01	Rounds,Squares Flat Bars	SS100	1956	176	10,636	10,256	0	PSP,SS	CNT(UNK) (25)SSP, SS,CT	RTP(25) RUP(75)	Zero Discharge
0060I 02	Rounds	SS100	1946	138	13,040	13,043	0	PSP,SS	CNT(UNK) (25)SSP, SS,CT	RTP(100)	Zero Discharge
0060K 01	Angle,Rounds, Flat Bars,Rebar Fence-Sign Post	CS100	1920	537	8,045	8,045	34.9	PSP	CNT(UNK) (UNK)SSP, SS,CT	RTP(99.6) BD(0.4)	Direct
0068 01	Dbl Bevel,Strip & Bands Cotton Ties	CS100	1901	78	UNK	UNK	UNK	PSP	OT	POTW	
0068 02	Rounds,Squares Flat Bar,Strip	CS100	1905	270	UNK	UNK	UNK	PSP,SS		OT	POTW
0068 03	Channel,Angle Square,Flat Bar Rebar	CS100	1914	144	UNK	UNK	UNK	PSP		OT	POTW
0068 04	Channel,Angle Squares,Flat Bar Rebar	CS100	1956	570	UNK	UNK	UNK	PSP		RUP-(UNK) BD(UNK)	POTW
0068 05	Rods	CS100	1968	399	UNK	UNK	UNK	PSP,SS		RUP(UNK) BD(UNK)	POTW
0068B	Angle,Channel Round,Square Flat, Rebar	CS100	1976	[353](1)	[20,386]	[20,386]	[0]	PSP		RUP(100)	Zero Discharge
0088A	H-Posts,Rounds	CS31, LA49,SS9 CMHR11	1942	531	561	561	561	PSP,(CLR), (VF)		(RTP)	Direct
0088D	Rounds	CS33, LA56 OS11	1962	885	[6,430]	[48]	[48]	PSP,SSP	CNT(2)39 ML,FLP, CL,SS,VF	[RUP (99.3) BD(0.7)]	Direct

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HOT FORMING SECTION
SUMMARY TABLE
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Plant Code	Products	Steel Types	Age 1st yr. of Prod.	Production Capacity Ton/Day	Flow (Gallons/Ton)			Treatment Components		Operating Mode	Discharge Mode
					Applied	Process	Discharge	Process Treatment	Central Treatment		
0112 01	I-Beams,WF-Beams	CS79, LA21	1907	2709	UNK	UNK	UNK	PSP	(CLR)	(RTP)	Direct
0112 02	I-Beams,WF-Beams	CS89 LA11	1917	1086	UNK	UNK	UNK	PSP	(CLR)	(RTP)	Direct
0112 03	Billets	CS85 LA15	1955	3771	UNK	UNK	UNK	PSP	(CLR)	(RTP)	Direct
0112 04	Rounds	ATS100	1915	195	UNK	UNK	UNK	PSP		(RTP)	Direct
0112 05	Billets	CS5,LA80 ATS15	1916	861	UNK	UNK	UNK	PSP		(RTP)	Direct
0112 06	I-Beam,Channel Zee, Angle	CS86, LA14	1917	552	UNK	UNK	UNK	PSP	(CLR)	(RTP)	Direct
0112 07	Rounds, Squares Hexagon,Flat Bar Octagon	SS2, ATS98	1963	138	33,391	33,391	3673	PSP, SS		RTP(89) BD(11)	Direct
0112 08	Angle	CS87, LA13	1919	642	UNK	UNK	UNK	PSP	(CLR)	(RTP)	Direct
0112 09	Rounds,Squares Hexagon,Flat Bar Octagon	ATS100	1917	17.4	UNK	UNK	UNK	PSP		(RTP)	Direct
0112 10	WF-Beams,I-Beams Channel, Bulb Angle,Ship Channel	CS85 LA15	1968	2301	UNK	UNK	UNK	PSP, SS	(CLR)	(RTP)	Direct
0112A 01	Billets	CS100	1918	3735	4627	4627	771	PSP		RTP(83.3) BD(16.7)	Direct
0112A 02	Rebar	CS100	1937	1101	UNK	UNK	3662	PSP		RUP(UNK) BD(UNK)	Direct
0112A 03	Rounds, Rod	CS100	1968	1455	UNK	UNK	3959	PSP, SS		RUP(UNK) BD(UNK)	Direct

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Plant Code	Products	Steel Types	Age 1st yr. of Prod.	Production Capacity Ton/Day	Flow (Gallons/Ton) Applied	Flow (Gallons/Ton) Process	Flow (Gallons/Ton) Discharge	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0112B 01	WF-Beams	CS100	1926	3321	UNK	UNK	UNK	PSP	CNT(1) (UNK)T, FDSP	RET(UNK) BD(UNK)	Direct
0112B 02	I-Beam,Channel, Zee,Sheet Piling Angle,Buldozer Track Shoe	CS85 LA15	1926	1461	UNK	UNK	UNK	PSP	CNT(1) (UNK),T, FDSP	RET(UNK) BD(UNK)	Direct
0112B 03	Billets, Rail Round	CS80 LA20	1928	1563	UNK	UNK	UNK	PSP	CNT(1) (UNK),T, FDSP	RET(UNK) BD(UNK)	Direct
0112B 04	Billets	CS80 LA20	1930	2538	UNK	UNK	UNK	PSP	CNT(1) (UNK),T, FDSP	RET(UNK) BD(UNK)	Direct
0112B 05	Rounds, Flat Bar,Hinge Bar, Leaf Spring	CS76 LA24	1940	711	UNK	UNK	UNK	PSP	CNT(1) (UNK),T, FDSP	RTP(UNK) RET(UNK) BD(UNK)	Direct
0112B 06	Round, Flat Bar Rebar	CS74 LA26	1946	900	UNK	UNK	UNK	PSP	CNT(1) (UNK),T, FDS(UNK)	RTP(UNK) RET(UNK)	Direct
0112B 07	Round, Flat Bar	CS76 LA24	1976	444	UNK	UNK	UNK	PSP	CNT(1) (UNK),T, FDSP	RTP(UNK) RET(UNK) BD(UNK)	Direct
0112C 01	Wheel Blanks	CS87 AS13	1920	180	UNK	UNK	UNK	PSP	CNT(UNK) SSP,SS,T, FDS(UNK)	OT	Direct
0112C 02	RR. Wheels	CS99 AS1	1920	375	UNK	UNK	UNK	PSP	CNT(UNK), SSP,SS,T, FDS(UNK)	OT	Direct
0112C 03	Billets, Round Slab	CS92 AS8	1940	1728	UNK	UNK	UNK	PSP	CNT(2) (UNK)SSP,SS T,CT,A,NC, FDS(UNK)	OT	Direct
0112C 04	Rounds	CS92 AS8	1950	849	UNK	UNK	UNK	PSP	CNT(UNK) SSP,SS,T, FDS(UNK)	OT	Direct
0112C 05	Billets	CS87 AS13	1952	3234	UNK	UNK	UNK	PSP	CNT(2) (UNK),SSP,SS T,CT,A,NC,FDS (UNK)	OT	Direct
0112C 06	Round Corner Squares,Tie Clips Bearing Segments	CS95 AS5	1918	105	UNK	UNK	UNK	PSP	CNT(2) (UNK),SSP,SS, T,CT,A,NC,FDS (UNK)	OT	Direct

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Plant Code	Products	Steel Types	Age 1st yr. of Prod.	Production Capacity Ton/Day	Flow (Gallons/Ton) Applied	Flow (Gallons/Ton) Process	Flow (Gallons/Ton) Discharge	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0112C 07	Bulb Angle, Rail Round,Square,Flat Bar,Tee Bar,Mine Ties,Rim Section Brake Beam	CS89 AS11	1926	648	UNK	UNK	UNK	PSP	CNT(2) (UNK),SSP SS,T,A, NC, FDS(UNK)	OT	Direct
0112C 08	Round, Square Hexagon, Flat Bar	CS88 AS12	1926	849	UNK	UNK	UNK	PSP	CNT(2) (UNK)SSP, SS,T,A,NC FDS(UNK)	OT	Direct
0112C 09	Flat Bar,Auto Leaf Sprg Band Tie Clip,Rail Anchor	CS91 AS9	1926	204	UNK	UNK	UNK	PSP	CNT(2) (UNK)SSP,SS, T,A,NC,FDS (UNK)	OT	Direct
0112C 10	Round, Square, Hexagon,Special Shapes	CS81 AS19	1963	999	UNK	UNK	UNK	PSP	CNT(2) (UNK)SSP, SS,T,A,NC, FDS(UNK)	OT	Direct
0112E 01	Billets, Rail	CS100	1914	3705	UNK	UNK	UNK	PSP	CNT(2) (UNK)SSP,SS, 03,SL(UNK)	(RTP)	Direct
0112E 02	Billets, Rounds Flat Bar,Misc.	CS97.2 LA1.4 BS1.4	1918	1200	UNK	UNK	UNK	PSP	CNT(2) (UNK)SS, 03,SL(UNK)	(RTP) RUP(UNK) BD(UNK)	Direct
0112E 03	Rebar	CS100	1960	2259	UNK	UNK	UNK	PSP	CNT(2) (UNK)SS, SL(UNK)	(RTP) RUP(UNK) BD(UNK)	Direct
0112F 01	I-Beam,Channel Angles,Rounds Square,Flat Bar	CS79 LA21	1922	567	UNK	UNK	UNK	PSP	CNT(2) (UNK)SSP, SS,CL,CT	RTP(UNK) REP(UNK) BD(UNK)	Direct
0112F 02	Round, Square Hexagon, Flat Bar, Rebar	CS97 LA3	1948	669	UNK	UNK	UNK	PSP	CNT(2) (UNK)SSP, SS,CL,CT	RTP(UNK) REP(UNK) BD(UNK)	Direct
0112G 01	I-Beam, Channel Zee,Angle,Round Flat Bar	N/A	1914	417	UNK	UNK	UNK	PSP SS	CNT(2) (UNK)SSP SS	RTP(UNK) REP(UNK) BD(UNK)	Direct
0112G 02	I-Beam,Channel, Angle, Round, Square,Flat Bar,Rebar	N/A	1958	675	UNK	UNK	UNK	PSP SS	CNT(2) (UNK)SSP SS	RTP(UNK) REP(UNK) BD(UNK)	Direct
0112I	Rounds,Squares Flat Bars	CS92 LA8	1926	711	UNK	UNK	UNK	PSP,SS, P,SS,E, CT,FDS (UNK)		RUP(UNK) BD(UNK)	Direct
0112J 01	I-Beam,Channel Angle,Square, Flat Bars,Billet	CS95 LA5	1924	378	UNK	UNK	UNK	PSP	CNT(1) (UNK)SSP>SS CT>SL(UNK)	RTP(UNK) REP(UNK) BD(UNK)	Direct

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Plant Code	Products	Steel Types	Age 1st yr. of Prod.	Production Capacity Ton/Day	Flow (Gallons/Ton) Applied	Flow (Gallons/Ton) Process	Flow (Gallons/Ton) Discharge	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0112J 02	I-Beam, Channel, Angle,Flat Bar Jail Bar	CS100	1924	339	UNK	UNK	UNK	PSP	CNT(1) (UNK)SSP,SS, CT,SL(UNK)	RTP(UNK) RET(UNK) BD(UNK)	Direct
0112J 03	Channel, Angle Hot Strip	CS100	1915	177	UNK	UNK	UNK	PSP	CNT(1) (UNK)SSP,SS CT,SL(UNK)	RTP(UNK) RET(UNK) BD(UNK)	Direct
0136B 01	Channel,Angle Round,Square,Flat Bar, Rebar	CS96 LA4	1908	522 (Closed 1'/77)	8372	8372	100	PSP	SSP	RTP(98.8) BD(1.2)	POTW
0136B 02	Channel,Angle Round,Square,Flat Bar,Rebar	CS96 LA4	1967	354	[22,942]	[22,942]	[121]	PSP SSP		RTP(99.5) BD(0.5)	POTW
0136C	Rebar,Flat Bar	CS100	1913	411	11,859	11,859	581	PSP,SSP SS,CT,02		RTP(95.1) BD(4.9)	POTW
0176 01	Round,Square,Hex, Flat Bar,Octagon Flutes	N/A All Special	1918	30.2	3,570	3,570	250	PSP	CNT(2)(14) SSP,SS,T,CT	RTP 93 BD 7	Direct
0176 02	Rounds,Square,Hex, Flat Bar,Octagon	N/A All Special	1927	10.5				PSP	CNT(2)(26) SSP,SS,T,CT		Direct
0176 03	Round,Square,Hex Flat Bar,Flutes	N/A All Special	1928	78				PSP	CNT(2)(28) SSP,SS,T,CT		Direct
0176 04	Wire	N/A All Special	1953	168	[13,700]	[13,700]	[336]	PSP	CNT(2)(18) SSP,SS,CL, CY,T	RTP(94.0) BD(6.0)	Direct
0188B	Round, Rebar	CS100	1940	804	7258	3657	145	PSP,SSP CT,SS		RTP(98) BD(2)	Direct
0188C	Round, Rebar	CS100	1956	462	7480	7480	140	PSP,SSP SS,SL(UNK)		RTP(98.1) BD(1.9)	Direct
0196A 01	**	**	**	**	**	**	**	**	**	**	**
0196A 02	**	**	**	**	**	**	**	**	**	**	**
0196A 03	**	**	**	**	**	**	**	**	**	**	**

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Plant Code	Products	Steel Types	Age 1st yr. of Prod.	Production Capacity Ton/Day	Flow (Gallons/Ton)			Treatment Components		Operating Mode	Discharge Mode
					Applied	Process	Discharge	Process Treatment	Central Treatment		
0196A 04	**	**	**	**	**	**	**	**	**	**	**
0196A 05	**	**	**	**	**	**	**	**	**	**	**
0196A 06	**	**	**	**	**	**	**	**	**	**	**
0196A 07	**	**	**	**	**	**	**	**	**	**	**
0196A 08	**	**	**	**	**	**	**	**	**	**	**
0916A 09	**	**	**	**	**	**	**	**	**	**	**
0196A 10	**	**	**	**	**	**	**	**	**	**	**
0196A 11	**	**	**	**	**	**	**	**	**	**	**
0240A 01	Round,Square	CS25 LA75	1943	948	[2600]	[2600]	[298]	PSP SSP	CNT(1) (UNK)SS,SL (UNK),(FP)	[RTP 88.5]	Direct
0240A 02	Round,Square Hex,Flat Bar	CS25 LA75	1941	474							Direct
0256K	Wire	**	1936	**	**	**	**	PSP,NL, FLP,CL		OT	Direct
0256N 01	Billets,Round	**	1950	**	**	**	**	PSP		RUP(100)	Zero Discharge
0256N 02	Billets,Round Square,Flat Bar	**	1920	**	**	**	**	PSP		RUP(100)	Zero Discharge
0256N 03	Billets,Round Square,Hex,Flat Bar	**	1920	**	**	**	**	PSP		RUP(100)	Zero Discharge

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Plant Code	Products	Steel Types	Age 1st yr. of Prod.	Production Capacity Ton/Day	Flow (Gallons/Ton) Applied	Flow (Gallons/Ton) Process	Flow (Gallons/Ton) Discharge	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0288A 01	Rings	CS20 ATS5 OS75	1925	7.2	4114	4114	4114	PSP, SSP,SS		OT	Direct
0288A 02	Rings	CS30 ATS5, OS65	1939	13.8	2527	2527	2527	PSP, SSP,SS		OT	Direct
0288A 03	Rings	CS30 SS2,OS68	1937	22.2	2359	2359	2359	PSP, SSP,SS		OT	Direct
0288A 04	Rings	CS20 SS1,ATS1, OS78	1941	11.19	3136	3136	3136	PSP, SSP,SS		OT	Direct
0288A 05	Rings	CS56 SS2,ATS2, OS40	1967	20.5	1995	1995	1995	PSP SS		OT	Direct
0288A 06	Rings	CS50 OS50	1960	4.0	7014	7014	7014	PSP SSP,SS		OT	Direct
0288A 07	Rolled R.R.Wheels	CS100	1919	333.6	316	316	316	PSP, SSP,SS		OT	Direct
0288A 08	Rings	CS95 OS5	1919	36.6	1328	1328	1328	PSP, SSP		OT	Direct

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Plant Code	Products	Steel Types	Age 1st yr. of Prod.	Production Capacity Ton/Day	Flow (Gallons/Ton)			Treatment Components		Operating Mode	Discharge Mode
					Applied	Process	Discharge	Process Treatment	Central Treatment		
0316	Round, Rebar	CS100	1959	446	9044	9044	5698	PSP	CNT(3)(36) SS,CT,SL (UNK)F(04)	RTP(37) BD(63)	Indirect
0316A	Billets,Rebar	CS100	1970	420	7543	7543	0	PSP, SSP,SS		RUP(100)	Zero Discharge
0316B	Round, Rebar	CS100	1961	423	10,383	10,383	0	PSP, SSP,SL (UNK)		RTP(100)	Zero Discharge
0316C	Round, Rebar	CS100	1976	Started 9/76	UNK	UNK	UNK	PSP		UNK	UNK
0320 01	Billets	ABS100	1936	1500	UNK	UNK	UNK	PSP	CNT(2) (UNK)SCR,NC SS,CL,SL(UNK)	OT	Direct
0320 02	Billets	ABS100	1936	1428	UNK	UNK	UNK	PSP	CNT(2) (UNK)SCR,NC, SS,CL,SL(UNK)	OT	Direct
0320 03	Flat Bars	ABS100	1936	588	UNK	UNK	UNK	PSP	CNT(2) (UNK)SCR,NC SS,CL,SL(UNK)	OT	Direct
0384A 01	Billets	CS30 LA1 FMS69	1967	2418	3055	3055	3055	PSP SSP	CNT(1)(14) SS,SL(UNK)	(RTP)	Direct
0384A 02	Billets, WF Blanks	CS55, LA3, FMS42	1967	3420	3055	3055	3055	PSP, SSP	CNT(1)(14) SS,SL(UNK)	(RTP)	Direct
0384A 03	Billets, WF, I-Beam,Channel,Zee Angle,Geuser Shoe, Brg.Caps	CS77, LA19	1917	1479	3797	3797	3797	PSP	CNT(1)(3.8) SSP,SL(UNK)	(RTP)	Direct
0384A 04	Billets,I-Beam Channel,Angle, Bulb Angle,Misc	CS56 LA21 FMS23	1902	933	3860	3860	3860	PSP	CNT(1)(29) SS,SL(UNK)	(RTP)	Direct
0384A 05	Billets,I-Beams Channel,Zee,Bulb Angle,Angle,Round Square,Hex,Flat Bar, Misc	CS65 LA15, Tes5, RAL15	1925	816	8029	8029	8029	PSP	CNT(2)(3) SS,SL(UNK)	(RTP)	Direct
0384A 06	Billets,Rounds Square,Angle,Hex Flat Bar,Rebar, Misc.	CS98 LA2,	1969	1758	3376	3355	79	PSP, SSP	CNT(2) (UNK)CL,CT, FLL,FLA,FLP FLW	RUP(33) RTP(64.6) BD(2.4)	Direct
0384A 07	Angles,Round, Square,hex,Flat Bar,Rebar,Misc	CS45, LA15 Tes15, RAL25	1931	879	3276	3276	3276	PSP	CNT(2)(2.5) SS,SL(UNK)	(RTP)	Direct

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Plant Code	Products	Steel Types	Age 1st yr. of Prod.	Production Capacity Ton/Day	Flow (Gallons/Ton) Applied	Flow (Gallons/Ton) Process	Flow (Gallons/Ton) Discharge	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0396D	Billets	CS100	1959	2031	0	0	0			(RTP)	NA
0424 01	Billets,Angle Round,Square,Hex Flat Bar	SS80 ATS20	1942	44	7283	7283	6024	PSP	CNT(1)(16), SS,SSP,CT, SL(UNK)FDS (UNK)	RTP(17) BD(83)	Direct
0424 02	Angle, Round, Square,Hex,Flat Bar	SS80 ATS20	1946	25	11,707	11,707	10654	PSP	CNT(1)(9) SS,SSP,CT, SL(UNK)FDS (UNK)	RTP(9) BD(91)	Direct
0424 03	Angle,Round, Square,Hex,Flat Bar	SS80 ATS20	1920	25	10,537	10,537	9588	PSP	CNT(1)(8), SS,SSP,CT, SL(UNK)FDS (UNK)	RTP(9) BD(91)	Direct
0432A 01	Bar, Billet	CS80 LA20	1910	2709	UNK	UNK	UNK	PSP		(RTP)	Direct
0432A 02	Other Shapes WF,I-Beam,Channel Angle,Flat Bar Jr.Channel,Truck Rims	CS60 LA40	1925	1167	[6340]	[6340]	[6340]	PSP	CNT(2) (UNK)SCR,CL FLL,VF,SS, FLM	(RTP)	Direct
0432A 03	Rounds	CS70 LA30	1927	1503	UNK	UNK	UNK	PSP		(RTP)	Direct
0432A 04	Rod	CS100	1952	1254	UNK	UNK	UNK	PSP SSP, CY,07		(RTP)	Direct
0432B 01	Billets,Rounds, Square,Hex,Rebar	CS95 LA5	1931	1179	UNK	UNK	UNK	PSP SS	(FP)	OT	Direct
0432B 02	Round,Square,Hex Flat Bar,Rebar, Octagon	CS95 LA4.5 SS0.5	1953	1000	UNK	UNK	UNK	PSP SS	(FP)	OT	Direct
0432J	Billets	OS10, SS90	1950	NA	UNK	UNK	UNK	PSP		OT	POTW
0440A	Angle,Round,Hex Square,Flat Bar Rebar	SS100	1928	45	3200	3200	3200	PSP	CNT(3)(18) SSP		POTW
0448A 01	Billets,WF,I-Beam,Channel,H-Section,Angle, Plate,Mine Arch	CS99 LA1	1944	1068	UNK	UNK	UNK	PSP	CNT(2) (UNK)CL,CT, SL(UNK)	RUP(UNK) RTP(UNK) RET(UNK) BD(UNK)	Direct
0448A 02	Channel,Round Rebar, Misc.	CS98 AS2	1945	583	UNK	UNK	UNK	PSP SSP	CNT(2) (UNK)CL,CT, SL(UNK)	RUP(UNK) RTP(UNK) RET(UNK) BD(UNK)	Direct

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Plant Code	Products	Steel Types	Age 1st yr. of Prod.	Production Capacity Ton/Day	Flow (Gallons/Ton)			Treatment Components		Operating Mode	Discharge Mode
					Applied	Process	Discharge	Process Treatment	Central Treatment		
0460A 01	Wire	CS100	1920	897	4816	4415	0	PSP SSP	CNT(2)(19) SCR,SS,T, SL(UNK)	RTP(100)	Zero Discharge
0460A 02	Wire	CS100	1958	702	7744	7385	0	PSP SS	CNT(2)(25) T,SCR, SL(UNK)	RTP(100)	Zero Discharge
0460B	Channel,Angle, Square,Round,Tee, Flat Bar	CS100	1969	441	32,686	327	327	PSP SSP, SS		RUP(99) BD(1)	POTW
0468B	Fence Post,Flanged Channel,Wire,Rebar	CS100	1968	1294	7,811	7,789	89	PSP,CT SSP,FLP, FF(UNK)		RTP(98.9) BD(1.1)	Direct
0468F	Wire, Rod, Rebar	CS100	1976	312	29,465	29,465	9841	PSP, SSP, SS	CNT(3)(69.5) SS,CT,SL (UNK)	RTP(66.6) BD(33.4)	Direct
0476A 01	Angle,Round,Square Flat Bar, Rebar	CS90 LA10	1915	190	16,719	16,293	10,786	PSP	CNT(2)(37), SCR,FLP,NL, CL,SS,CY, SL(UNK)	RTP(33.8) BD(66.2)	Direct
0476A 02	Rounds, Rebar	CS100	1946	502	9018	8746	1010	PSP, SS	CNT(2) (UNK)SCR,SS FLP,NL,CL, CY,SL(UNK)	RTP(88.8) BD(11.2)	Direct
0476A 03	Round,Square, Flat Bar,Rebar	CS75 LA25	1969	800	10,075	282	282	PSP, SS	CNT(2)(0.4) SCR,FLP,NL, CL,SS,CY, SL(UNK)	RUP(97.2) BD(2.8)	Direct
0584F(2)	WF,I-Beam,Zee, Channel,Piling, Flat Bar,Angle	CS50 VGS50	1930	807	14,900	14,900	14,900	PSP	CNT(2)(5.5) SS,01,SL (UNK)	OT	Direct
0612 01	Billets	CS100	1952	3162	[4204]	[4204]	[84]	PSP SSP	CNT(1)(24.5) SCR,SR,FDS	RTP(98) BD(2)	Direct
0612 02	WF-Beam,Channel	CS100	1963	1386	[9870]	[9870]	[197]	PSP SSP	CNT(1)(19.4) SS,02,FDS	RTP(98) BD(2)	Direct
0612 03	WF-Beam,Channel Angle	CS100	1957	1092	[12,527]	[12,527]	[250]	PSP SSP,	CNT(1)(19.4) SS,02,FDS	RTP(98) BD(2)	Direct
0612 04	Angle,Round, Flat Bar,Rebar	CS100	1951	948	[4204]	[4204]	[84]	PSP SSP	CNT(1)(24.5) SS,02,FDS	RTP(98) BD(2)	Direct
0612 05	Round	CS100	1936	1239	5462	5462	174	PSP,SSP SS,CT, FDS(UNK)		RTP(96.8) BD(3.2)	Direct

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					Flow (Gallons/Ton)			Treatment Components			
Plant Code	Products	Steel Types	Age 1st yr. of Prod.	Production Capacity Ton/Day	Applied	Process	Discharge	Process Treatment	Central Treatment	Operating Mode	Discharge Mode
0640	Rod Mill,Round Rebar	CS100	1953	903	3352	3352	3352	PSP	CNT(2)(40) SL(UNK)FDS (UNK)	OT	Direct
0640A 01	Round,Rebar	CS100	1954	203	11,449	11,449	345	PSP SSP SS	CNT(2)(14), SS,SL(UNK) FDS(UNK)	RTP(97) BD(3)	POTW
0640A 02	Channel,Angle Round,Flat Bar	CS100	1954	507	13,775	13,775	331	PSP, SSP,SS	CNT(2)(44)	RTP(97.6) BD(2.4)	POTW
0652A 01	22"Structural, I-Beam,Channel	CS86 LA14	1906	243	7111	7111	7111	PSP, SS,SSP		OT	Direct
0652A 02	I-Beam,Channel Angle	CS86 LA14	1907	345	6261	6261	6261	PSP, SS,SSP		OT	Direct
0672A 01	I-Beam,Channel Angle,Flat Bar Rebar,Mini-Beams	CS84 LA16	1951	817	5418	5418	563	PSP,SS SSP,SS	CNT(2)(45) SS,T,SL(UNK)	RTP(89.6) BD(10.4)	Direct
0672A 02	Round,Flat Bar Jail Bar,Guy	CS100	1930	328	10,967	10,967	1151	PSP,SS SSP,SS	CNT(2)(37) SS,T,SL(UNK)	RTP(89.5) BD(10.5)	Direct
0672B 01	I-Beam,Channel Rail,Spec.Section	CS40 LA60	1907	270	4880	4747	0	PSP SSP		RTP(100)	Zero Discharge
0672B 02	I-Beam,Channel Bulb Angle,Spec. Bar	CS40 LA60	1918	462	5922	5610	0	PSP		RTP(100)	Zero Discharge
0684A 01	Billets	CS95 LA5	1911	2112	1705	1705	1705	PSP, SS		OT	Direct
0684A 02	Automotive Parts Scraper Blades	CS100	1911	573	10,052	10,052	10,052	PSP		OT	Direct
0684A 03	Billets	CS100	1923	2052		DISMANTLED					
0684D 01	Billets	CS15 AS85	1918	1929	1493	1493	1493	PSP	CNT(2)(33) SS,SL(UNK)	OT	Direct
0684D 02	Billets,Round Flat Bar	CS15 SS2,AS83	1920	1626	1689	1689	1689	PSP	CNT(2) (UNK)SS,SL (UNK)	OT	Direct
0684D 03	Round,Square,Hex Flat Bar,Octagon	SS48 AS52	1920	51	UNK	UNK	UNK	PSP	CNT(2) (UNK)SS,SL (UNK)	OT	Direct

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Plant Code	Products	Steel Types	Age 1st yr. of Prod.	Production Capacity Ton/Day	Flow (Gallons/Ton) Applied	Flow (Gallons/Ton) Process	Flow (Gallons/Ton) Discharge	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0684E 01	Round,Square	CS22 SS1,AS77	1920	1185	3087	3087	1440	PSP	CNT(2)(45) SS,CL,CT,FL (UNK)SL(UNK)	RTP(53.3) BD(46.7)	Direct
0684E 02	Round,Square Hex,Octagon	CS19 SS6 AS75	1961	504	8571	8571	4003	PSP, SS	CNT(2)(53), SS,CL,CT,FL (UNK)SL(UNK)	RTP(53.3) BD(46.7)	Direct
0684F 01	Billets	CS98 LA2	1916	1338	3767	3767	3767	PSP, SS SSP	CNT(1)(14) SS,VF,FLL,FLP FL06,SCR,CL FDS(UNK)	OT	Direct
0684F 02	Round,Square Flat Bar	CS92 LA8	1927	765	8282	UNK	UNK	PSP SS SSP	CNT(1)(17) SS,VF,FLL,FLP FL06,SCR,CL, FDS(UNK)	OT	Direct
0684F 03	Round,Square Flat Bar,Rebar	CS98 LA2	1927	756	8190	UNK	UNK	PSP SS, SSP, SS	CNT(2)(8) CL,VF,SCR,FLL, FLP,FL06,FDS (UNK)	OT	Direct
0684G 01	Billets	CS63 ATS37	1916	900	2240	2240	2043	PSP	CNT(2)(15) NW,FLL,NL, FL06,VF,CL FLP,SS	REU(8.8) BD(91.2)	Direct
0684G 02	Round,Square Flat Bar	CS81 ATS19	1918	1131	4774	4774	4774	PSP SS	CNT(1)(51) SSP,SS	OT	Direct
0684G 03	Square,Flat Bar Rebar, Other	CS53 ATS47	1918	573	5026	5026	5026	PSP,	CNT(1)(27.2) SSP,SS	OT	Direct
0684G 04	Round,Square Flat Bar,Rebar	CS61 ATS39	1920	237	9722	9722	9722	PSP	CNT(1)(21.8)	OT	Direct
0684H 01	Billets	CS70 AS30	1943	2898	[4710]	[4710]	[14]	PSP SSP, SS	CNT(1)(15) FLP,SS,FLL, CL,T,CT	RTP(99.7)	POTW
0684H 02	Round, Square	CS33 AS67	1958	1758	[580]	[580]	[1.7]	PSP SSP SS	CNT(1)(15) FLP,SS,FLL CL,CT,T	RTP(99.7)	POTW
0684H 03	Round, Square Flat Bar	CS63 AS37	1943	2898	[910]	[910]	[2.8]	PSP SS	CNT(1)(7) FDS(UNK)CL	RTP(99.7)	POTW
0684H 04	Squares	CS85 AS15	1947	1314	3792	3792	193	PSP SSP	CNT(1)(13) VF,FLL,FLP, CL,T,SS,CT, FDS(UNK)	RTP(94.9) BD(5.1)	Direct

TABLE III-3
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SUMMARY TABLE
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Plant Code	Products	Steel Types	Age 1st yr. of Prod.	Production Capacity Ton/Day	Flow (Gallons/Ton) Applied	Flow (Gallons/Ton) Process	Flow (Gallons/Ton) Discharge	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0684H 05	Rounds,Square, Hex,Flat Bar	CS68 LA2,AS30	1967	1707	[3507]	[2468]	[10]	PSP SS	CNT(UNK) (UNK),NA, FLP,CL,CT	RUP44 RTP55.7 BDO.3	POTW
0684H 06	Round,Hex,Rebar	CS82 ATS1,AS17	1958	996	[3400]	[3400]	[10]	PSP SS	CNT(1)(39)	[RTP99.7]	POTW
0684H 07	Round,Hex,Rebar	CS87 AS13	UNK	432							POTW
0776G 01	Billets,Round Square	CS2,SS11 LA9,MS5 ATS73,	Pre-1950	66	*	*	*				
0776G 02	Round,Square Hex,Flat Bar	CS2,SS11 LA9,MS5 ATS73	Pre-1950	17	*	*	*				
0776G 03	Square,Hex, Flat Bars	CS2,SS11 LA9,MS5 ATS73	Pre-1950	6	*	*	*				
0776G 04	Combination Mill, Rounds	CS2,SS11 LA9,MS5 ATS73	Pre-1950	25	*	*	*				
0776H 01	Flat Bars	ATS100	1902	37	2347	2347	2347	PSP			Direct
0796A 01	**	**	**	**	**	**	**	**	**	**	**
0796A 02	**	**	**	**	**	**	**	**	**	**	**
0796A 03	**	**	**	**	**	**	**	**	**	**	**
0796A 04	**	**	**	**	**	**	**	**	**	**	**
0804B 01	Seamless Rings	CS75 HSLA25	1890	150	138	138	12.8		CNT(1)(19.6)	RTP(90.7) BD(9.3)	Direct
0804B 02	Seamless Rings	CS60 HSLA40	1948	342	131	131	131	PSP		OT	Direct
0856A 01	Flat Bar,Specials	CS79 LA14,AS7	1903	471	UNK	UNK	UNK	PSP SS	(CLR),(FP)	(RTP)	Direct
0856A 02	Channel, Zee, Bulb Angle,Angle	CS67 LA31,AS1.8	1905	525	UNK	UNK	UNK	PSP SS	(CLR),(FP)	(RTP)	Direct

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SUMMARY TABLE
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Plant Code	Products	Steel Types	Age 1st yr. of Prod.	Production Capacity Ton/Day	Flow (Gallons/Ton)			Treatment Components		Operating Mode	Discharge Mode
					Applied	Process	Discharge	Process Treatment	Central Treatment		
0856A 03	I-Beam,Channel Angle	CS89 LA11,ATS0.2	1907	396	UNK	UNK	UNK	PSP	(CLR),(FP)	RTP	Direct
0856A 04	I-Beam,Channel M-Beam,Tee,Misc	CS96, LA3.5 AS0.3	1910	444	UNK	UNK	UNK	PSP	(CLR),(FP)	RTP	Direct
0856F 01	Blooms & Skelp	CS100	1952	6867	1258	1258	419	PSP SS	CNT(2)(3), BOA1,FLP, GF,SL(UNK)	RUP(66.7) BD(33.3)	Direct
0856F 02	Billets,Round Skelp	CS100	1952	6867	952	952	476	PSP SS	CNT(2)(3), BOA1,FLP GF,SL(UNK)	RUP(50) BD(50)	Direct
0856F 03	Billets	CS100	1952	5232	UNK	UNK	UNK	PSP SS	CNT(2)(6), BOA1,FLP, GF,SL(UNK)	RUP(50) BD(50)	Direct
0856F 04	Angle,Round Flat Bar,Rebar	CS100	1953	1057	12,238	12,238	6804	PSP SS	CNT(2)(8) BOA1,FLP, GF,SL(UNK)	RUP(44.4) BD(55.6)	Direct
0856F 05	Rod	CS100	1969	2133	8101	8101	8101	PSP	CNT(2)(97) SS,SL(UNK)	OT	Direct
0856H 01	WF-Beam,H-Pile	CS86, LA14	1927	1683	1515	1515	1515	PSP SS	CNT(2)(25)	OT	Direct
0856H 02	I-Beam,Channel Zee,Sheet Piling Misc. Shapes	CS72, LA23	1926	1338	1906	1906	1906	PSP SS	CNT(2)(10)	OT	Direct
0856K 01	Circular Sect. Forging	CS100	1918	123	61	61	61	PSP SS		OT	Direct
0856K 02	Axles	CS100	1966	255	198	198	198	PSP SS	CNT(2)(4), CL,FLP	OT	Direct
0856K 03	Wheels	CS98 AS2	1971	732	1770	1770	1770	PSP SS	CNT(2)(95) CL,FLP	OT	Direct
0856N 01	Round, Rebar	CS65, ATS17,MS11 RAL5,BS2	1970	3348	3226	3226	3226	PSP SS	CNT(2)(50) SL(UNK) (CLR),(FP), (CT)	(RTP)	Direct
0856N 02	Rebar	CS65, ATS17,MS11 RAL5,BS2	1970	1722	6272	6272	6272	PSP SS	CNT(2)(50) SL(UNK) (CLR),(FP), (CT)	(RTP)	Direct

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Plant Code	Products	Steel Types	Age 1st yr. of Prod.	Production Capacity Ton/Day	Flow (Gallons/Ton) Applied	Flow (Gallons/Ton) Process	Flow (Gallons/Ton) Discharge	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0856P	Rods	CS99 LA1	1955	1233	5656	5656	5656	PSP	CNT(2)(86) SSP,SS	OT	Direct
0856Q 01	Rounds	CS60, LA40	1932	2979	UNK	UNK	UNK	PSP SSP	CNT(2)(UNK) SS,SL(UNK)	OT	Direct
0856T 01	Round,Square	CS60 OS40	1906	1029	535	535	535	PSP		OT	Direct
0856U 01	Misc.Shapes	CS100	1925	204	14,894	14,894	14,894	PSP	CNT(2)(5) SSP,SS	OT	Direct
0856U 02	Misc. Shapes	CS100	1926	690	6699	6699	6699	PSP	CNT(2)(8) SSP,SS	OT	Direct
0856U 03	Angle,Flat Bar, Half Round,Other	CS95 LA5	1918	378	5638	5638	5638	PSP	CNT(2)(3.8) SSP,SS	OT	Direct
0856U 04	Flat Bar and Other Shapes	CS100	1918	225	12,288	12,288	12,288	PSP	CNT(2)(5) SSP,SS	OT	Direct
0856U 05	Square,Strip, Round,Spring Steel Flat Bar,Rebar, Other Shapes	CS80 LA20	1931	693	8125	8125	8125	PSP	CNT(2)(10) SSP,SS	OT	Direct
0860B 01	Billets,Round Square, Flat Bar	CS94 LA1,AS5	1971	2132	3309	3309	3309	PSP SS	CNT(2)(6.7) SS,SL(UNK),	(RTP)	Direct
0860B 02	I-Beam,Channel Zee,Bulb Angle, Angle Special	CS94 LA1, AS5	1909	536	5909	5909	5909	PSP SS	(FP),CNT(2) (3)SS,SL(UNK) (FP)	(RTP)	Direct
0860B 03	I-Beam,Channel Tee,Bulb Angle Square	CS94 LA1 AS5	1910	486	6522	6522	6522	PSP SS	CNT(2)(3) SL(UNK),SS, (FP)	(RTP)	Direct
0860B 04	Bar	CS94 LA1,AS5	UNK	1135	2663	2663	2663	PSP	CNT(2)(3)SS, SL(UNK),(FP)	(RTP)	Direct
0860B 05	Tee,Angle,Flat Bar,Spec.Section	CS94 LA1,AS5	1911	429	9399	9399	9399	PSP	CNT(2) (4)SS,SL	(RTP)	Direct
0860B 06	Bulb Angle Square,Flat,Spec.	CS94 LA1,AS5	1911		IDLE				(UNK),(FP)	OT	Direct

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Plant Code	Products	Steel Types	Age 1st yr. of Prod.	Production Capacity Ton/Day	Flow (Gallons/Ton) Applied	Flow (Gallons/Ton) Process	Flow (Gallons/Ton) Discharge	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0860B 07	Round,Square Hex,Rebar,Spec.	UNK	1911	IDLE							
0860B 08	Round,Rebar	CS94 LS1,AS5	1919	492	11,993	11,993	11,993	PSP	CNT(2)(5.6) SS,SL(UNK)	OT	Direct
0860B 09	Channel,Angle Flat Bar,Strip	CS94 LS1,AS5	1927	474	7590	7590	7590	PSP	CNT(2)(3.4) SS,SL(UNK)	OT	Direct
0860B 10	Round, Flat Bar Rebar,Spec.Sect.	CS94 LA1,AS5	UNK	892	12,751	12,751	12,751	PSP	CNT(2)(10.8) SS,SL(UNK)	OT	Direct
0860B 11	Mill,Round,Flat Bar,Rebar	CS94 LA1,AS5	1972	1464	6880	6880	6880	PSP	CNT(2)(9.6) SS,SL(UNK)	OT	Direct
0860F 01	Wire Rods	CS97 LA3	1936	726	7934	7934	793	PSP SS	CNT(2)(25) SSP,T,VF,F, NA,NL,CT FDS(UNK)	RTP(90) BD(10)	Direct
0860F 02	Wire Rods	CS94 LA6	1943	1167	4936	4936	494	PSP SS	CNT(2)(25) SSP,T,VF,F NA,NL,CT, FDS(UNK)	RTP(90) BD(10)	Direct
0860H 01	WF-Beam	CS80 LA20	1931	2616	7796	7796	218	PSP SS	CNT(2)(18.7) SSP,SS,SCR, FLL,FLA,VF CL,T	RTP(97.2) BD(2.8)	POTW
0860H 02	WF-Beam,I-Beam Channel,Sheet Piling,Angle Zee	CS85 LA15	1959	1380	[4720]	[4720]	[180]	PSP SS	CNT(2)(22.7) SSP,SS,SCR FLL,FLA,VF CL,CT,T	RTP(96) BD(4.0)	POTW
0860H 03	Rod, Coils	CS99 ATS1	1974	2058	[6930]	[6930]	[90]	PSP,SSP SS,CT, E,FSP, VF,T		RTP(99) BD(1)	Indirect
0864A	Billets,WF-& I-Beam,Channel Zee,Angel	CS94 LA6	UNK	2040	10,729	10,729	933	PSP	CNT(2)(83) SS,CL SL(UNK)	RUP(78.9) RTP(12.3) BD(8.7)	Direct
0864B	Round	CS100	1941	1161	9054	9054	245	PSP	CNT(2)(1.6) NL,FLL,FLP CL,NA,SS,T	RUP(97.3) BD(2.7)	Direct
0864C 01	Billets,Channel Angle,Round,Flat Bar,Rebar	CS75 LA5,ATS20	1916	450	3840	3840	280	PSP SS	CNT(2)(29) SSP,SS,CT, SL(UNK)	RTP(92.7) BD(7.3)	Direct
0864C 02	Channel,Angle Round,Flat Bar Rebar	CS75 LA5 ATS20	1916	360	10,000	10,000	730	PSP SS	CNT(2)(61) SSP,CT,SS SL(UNK)	RTP(92.7) BD(7.3)	Direct

TABLE III-3
HOT FORMING SECTION
SUMMARY TABLE
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Plant Code	Products	Steel Types	Age 1st yr. of Prod.	Production Capacity Ton/Day	Flow (Gallons/Ton)			Treatment Components		Operating Mode	Discharge Mode
					Applied	Process	Discharge	Process Treatment	Central Treatment		
0868A 01	Rails	CS100	1908	1902	1020	1020	1020	PSP	CNT(2)(23) SSP,SS, SL(UNK)	OT	Direct
0868A 02	Mill,Billets, Blooms	CS95 LA5	1912	2307	709	709	709	PSP	CNT(2)(23.5) SS,SSP, SL(UNK)	OT	Direct
0868A 03	I-Beam,Channel Bulb Angle,Angle	CS95 LA5	1919	1386	1647	1647	224	PSP	CNT(2)(3.8) SSP,SS, SL(UNK)	RTP(86.4) BD(13.6)	Indirect
0868A 04	R<R<Axel	CS100	1923	249	3909	3909	532	PSP	CNT(2)(1.6) SS,SL(UNK)	RTP(86.4) BD(13.6)	Indirect
0868A 05	Round,Square Flat Bar,Rebar	CS98 LA2	1924	537	963	963	131	PSP	CNT(2)(0.85) SSP,SS, SL(UNK)	RTP(86.4) BD(13.6)	Indirect
0868A 06	Billets	CS95 LA5	1925		IDLE						
0920B 01	Round,Square	CS100	1908	1806	1037	1037	421	PSP	CNT(2)(13) SSP	RTP(59.4) BD(40.6)	Direct
0920B 02	Rounds	CS100	1910	516	1674	1674	1674	PSP		(RTP)	Direct
0946A 01	Round,Square Flat Bar,Spec.	CS77, LA23	1907	759	7589	7589	1009	PSP	CNT(2)(22) SSP,FDSP	RTP(86.7) BD(13.3)	Direct
0946A 02	Round,Square Flat Bar,Misc.	CS25, LA65	1926	906	8742	8742	1609	PSP	CNT(2)(30) SSP,T,FLP FDSP	RTP(81.6) BD(18.4)	Direct
0946A 03	Round, Square Hex	CS80 LA20	1961	831	7798	7798	328	PSP SS		RTP(95.8) BD(4.2)	POTW
0948B	Rounds	CS56 LA44	1914	768	2625	2625	2625	PSP		OT	Direct
0948F 01	Round,Square Hex, Rebar	CS60 LA10,RAL30	1915	424	UNK	UNK	UNK	PSP SS		OT	Direct
0948F 02	Zee,Angle,Round Square,Hex,Rebar	CS60 LA8,RAL32	1916	583	UNK	UNK	UNK	PSP SS		OT	Direct
0948F 03		CS96 CB4	1933	29	3750	3750	3750	PSP		OT	Direct

TABLE III-3
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FOOTNOTES

(1) 1977 value
(2) Mill no longer in operation.

* : Dry Operation
**: Confidential Data
: Data listed in brackets was received in the responses to the detailed questionnaires or during sampling visits
(): See note on Table III-2.

Steel Types

CS : Carbon Steel
LA : Low Alloy Steel
SS : Stainless Steel
CMHR: Chrome/Molybdenum Heat Resistant
OS : Other Steel Not Identified
ATS : Alloy Tool Steel
ES : Electrical Steel

AS : Alloy Steel
BS : Boron Steel
ABS: Alloy Bar Steel
FMS: Free Machining
RAL: Resulphurized and Leaded
VGS: Vanadium Grade Steel
MS : Managing Steel

Additional Footnotes

01: Decant Tank
02: Inclined Plate Separator
03: Settling Basin
04: Continuous Cloth Filter
05: Settling Tank
06: Flocculation w/Ferric Chloride

For a definition of other C&TT Codes, see Table VII-1.

TABLE III-4

GENERAL SUMMARY TABLE
HOT FORMING: FLAT-HOT STRIP AND SHEET

Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity (Tons/Day)	Flow (Gallon/Ton)			Treatment Components		Operating Mode	Discharge Mode
					Applied	Process	Discharge	Process Treatment	Central Treatment		
0020B	Plate, Hot Strip	SS-40 ES-60	1953	2,550	[5690]	[5690]	[5690]	PSP	SSP,CL, FDS(UNK)	OT	Direct
0060	Hot Strip	CS-95 LA-5	1968 (1971)	10,032	8,297	7,936	251	PSP,SS	CNT2-82.6, FLL,FLO(1), CL,VF,CT	RUP-4,RTP-94, BD3	Direct
0060B	Hot Strip	CS-98.4 LA-1.6	1953 (1967)	4,790	UNK	UNK	UNK	PSP,SSP,SS	CNT2(UNK),NL, FLP,CL,VF,CT	RTP(UNK),RET (UNK),BD(UNK)	Direct
0060D	Hot Strip	CS-5.1 SS-22.4 ES-72.5	1958	2,520	7,143	7,143	UNK	PSP	CNT2(UNK), FLL,FLP,FL (01),CL,SL (UNK),CT	RTP(UNK), RET(UNK), BD(UNK)	Direct
0112A-03	Hot Strip, Skelp	CS-100	1937 (1960)	6,978	4,911	1,405	1,405	PSP,CT	CNT2(UNK),SS, Scr,AE,NL, FLA,FLP,SL (UNK),CY,T	RUP-71.4, BD-28.6	Direct
0112-04	Plate,Sheet, Hot Strip, Skelp	CS-95 LA-5	1947	7,893	5,619	584	584	PSP,CT	CNT2(UNK),SS Scr,AE,NL,FLA FLP,SL(UNK), CY,T	RUP-89.6, BD-10.4	Direct
0112B	Plate,Hot Strip,Sheet	CS-99.9 LA-0.1	1936 (1957)	7,368	UNK	UNK	UNK	PSP	CNT2(UNK),SS, FDS(UNK),T	RTP((UNK), BD(UNK)	Direct
0112D-02	Plate, Sheet	CS-98.6 LA-1.4	1966	12,744	[5790]	[5790]	[5790]	PSP	CNT2-61.3, CL,FLP,NL, NW,CR,SL(UNK)	OT	Direct
0176	Hot Strip	CS+ES 100	1953	240	9,630	9,630	693	PSP	CNT2-13,SSP, T,SS,CY,CL	RTP-92.8, BD-7.2	Direct
0248B	Plate,Hot Strip,Slabs	CS-10 SS-90	1960	1,500	7,680	7,680	92	PSP,SSP	FLP,Scr,TP, CT,SS	RTP-98.8, BD-1.2	Direct

TABLE III-4
GENERAL SUMMARY TABLE
HOT FORMING: FLAT-HOT STRIP AND SHEET
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Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity (Tons/Day)	Flow (Gallon/Ton) Applied	Flow (Gallon/Ton) Process	Flow (Gallon/Ton) Discharge	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0256C	Hot Strip	CS-86.15 SS-8.45 ES-5.4	1952 (1967)	2,328	UNK	UNK	UNK	PSP	CNT2(UNK),SL (UNK),SS	RTP(UNK), BD(UNK)	Direct
0256L-03	**	**	**	**	**	**	**	**	**	**	**
0256L-04	**	**	**	**	**	**	**	**	**	**	**
0320-02	Sheet	CS-100	1974	8,232	9,951	6,737	6,737	PSP,SS	CNT2-52.7, NC,SC,CL, SL(UNK)	RUP-32.3, BD-67.7	Direct
0384A-02	Hot Strip	CS-96.2 LA-2.9 ES-0.9	1965 (1967)	12,291	10,193	7,380	7,380	PSP,SS	FLL,FLP,FLA, FLO(1),SS,CL	RUP-UNK, (RTP) (UNK) BD-72.4	Direct
0384A-03	Plate, Strip,Sheet	CS-83.9 LA-16.1	1932 (1958)	3,666	17,511	17,511	17,511	PSP	CNT2-31.8, SS,SL(UNK)	(RTP)	Direct
0384A-04	Plate,Strip, Sheet	CS-98.8 LA-1.2	1938 (1960)	5,400	8,573	8,573	8,573	PSP	CNT2-23, SL(UNK),SS	(RTP)	Direct
0396D-01	Hot Strip	CS-100	1927	231	24,935	24,935	UNK	PSP	CNT2(UNK), SL(UNK),SS	RTP(UNK), BD(UNK)	POTW
0396D-02	Hot Strip	CS-100	1960	1,638	7,033	7,033	UNK	PSP,CT,FDSP, CL,VF	CNT2(UNK),SS SL(UNK)	RTP(UNK), BD(UNK)	Indirect to POTW
0424-02	Plate, Sheet	CS-100	1950	20.1	716	716	716	-	CNT2(UNK), FDSP,SL(UNK), CT	OT	Direct
0432A	Hot Strip, Skelp	CS-90 LA-5 ES-5	1957	4,950	[4800]	[4800]	[4800]	PSP,SS	CNT2(UNK), FLP,FLM,CL, SS,Scr,VF	OT	Direct
0432B	Plate, Hot Strip	CS-90 SS-10	1937	3,942	UNK	UNK	UNK	PSP,SS	-	OT	Direct

TABLE III-4
GENERAL SUMMARY TABLE
HOT FORMING: FLAT-HOT STRIP AND SHEET
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Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity (Tons/Day)	Flow (Gallon/Ton)			Treatment Components		Operating Mode	Discharge Mode
					Applied	Process	Discharge	Process Treatment	Central Treatment		
0432C	Plate,Hot Strip,Skelp	CS-92 SS-4 LA-4	1964	10,404	[3500]	[3042]	[375]	-	CNT2-65,PSP, SS,FLL,FLP, A,CL,VF,CT	[RUP-13.1, RTP-76.2, BD-10.7]	Direct
0448A-01	Plate, Skelp	CS-96 AS-4	1943 (1969)	2,417	UNK	UNK	UNK	PSP,SS	CNT2(UNK),CL, SL(UNK),CT	RUP(UNK), RTP(UNK), RET(UNK)	Indirect
0448-02	Plate,Hot Strip,Sheet Skelp	CS-95 AS-5	1950 (1969)	5,509	UNK	UNK	UNK	PSP,SS,CL, SL(UNK),CT	-	RUP(UNK), RTP(UNK), BD(UNK)	POTW
0476A	Plate,Sheet Hot Strip, Skelp, Bar	CS-80 LA-20	1915 (1960)	828	6,282	6,282	2,525	PSP	CNT2-60.7, SSP,Scr,SS, NL,FLP,CL, SL(UNK)	RTP-59.8, BD-40.2	Direct
0492A	Skelp	CS-100	1953	3,152	3,471	3,471	3,471	PSP,SSP	CNT2-9.8 SL(UNK),SS	RET100	Indirect
0528A	Hot Strip	CS-94 SS-3 LA-3	1955	5,549	4,686	4,686	4,686	PSP	CNT2-66,ASF CO,EB,FLP, NL,Scr,CL, T,SS	OT	Direct
0584B	Plate, Hot Strip	CS-80 LA-20	1961	14,022	[4150]	[4150]	[4150]	PSP,SSP,SS	-	OT	Direct
0584C	Hot Strip	CS-80 LA-20	1967	9,375	3,680	3,680	3,680	PSP,S,SSP	CNT2-48.6, SS,SL(UNK), FDSP,CLB,SO2 dechlorination	(RTP)	Direct
0584F	Hot Strip	CS-100	1927 (1955)	8,323	[3160]	[3160]	[3160]	PSP	CNT2-40.7, SL(UNK),SS (CLR),(VF),(FP)	OT	Direct

TABLE III-4
GENERAL SUMMARY TABLE
HOT FORMING: FLAT-HOT STRIP AND SHEET
PAGE 4

Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity (Tons/Day)	Flow (Gallon/Ton)			Treatment Components		Operating Mode	Discharge Mode
					Applied	Process	Discharge	Process Treatment	Central Treatment		
0684B	Plate,Hot Strip,Sheet, Skelp	CS-84 SS-5 LA-2 AT-1 ES-8	1961 (1964)	6,396	[6660]	[4061]	[887]	PSP,SL(UNK), CT	-	[RUP-39.0 RTP-47.7, BD-13.3]	Direct
0684F-02	Plate,Sheet, Skelp	CS-94 SS-2 LA-4	1971	8,223	9,347	7,578	327	PSP	CNT2-56.0, Scr,FLL,FLP, FLO(1),CL,SS, SL(UNK),FDS (UNK),CT,VF	RUP-18.9, RTP-77.6 BD+Losses-3.5	Direct
0684I-01	Hot Strip	CS-96 LA-4	1957 (1964)	3,429	5,802	5,802	5,288	PSP	CNT2-13.8, SSP,SS,BOA1, NW,SL(UNK),SS	RTP-8.9, BD-91.1	Direct
0684V-02	Sheet	SS-100	1916	20.7	8,803*	8,803*	403*	PSP,SS, SL(UNK)	-	RTP-95.4, RET-4.6	Indirect
0776H-02	Sheet	SS-10 LA-15 AT-75	1902 (1962)	18	6,400	6,400	6,400	PSP	-	OT	Direct
0856D	Hot Strip	CS-85 LA-11 ES-4	1938 (1961)	8,445	4,450	4,450	4,450	-	PSP,SS,(CLR) (FP), (CT)	(RTP)	Direct
0856E	Plate, Sheet	SS-100	1927	28	UNK	UNK	UNK	-	-	OT	Direct
0856F-01	Hot Strip	CS-100	1952	9,168	5,497	4,238	4,238	PSP	CNT2-45, GF,SC,FLP, BOA(1),SL (UNK),SS	RUP-22.9, BD-77.1	Direct
0856F-02	Skelp	CS-100	1953	3,042	2,840	947	947	PSP	CNT2-3.3,GF, SC,FLP, BOA(1),SL (UNK),SS	RUP-66.7, BD33.3	Direct

TABLE III-4
GENERAL SUMMARY TABLE
HOT FORMING: FLAT-HOT STRIP AND SHEET
PAGE 5

Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity (Tons/Day)	Flow (Gallon/Ton)			Treatment Components		Operating Mode	Discharge Mode
					Applied	Process	Discharge	Process Treatment	Central Treatment		
0856P	Hot Strip	CS-100	1929	253	5,125	5,125	5,125	PSP,SS	CNT2-98, SSP,SS	OT	Direct
0856U-01	Hot Strip, Skelp,Bar	CS-100	1929	558	11,277	11,277	11,277	PSP	CNT2-11.3, SSP,SS	OT	Direct
0856U-02	Hot Strip, Specials	CS-100	1918	150	22,944	22,944	22,944	PSP	CNT2-6.9, SSP,SS	OT	Direct
0856U-03	Hot Strip	CS-95 LA-5	1920	639	6,400	6,400	6,400	PSP	CNT2-7.3, SSP,SS	OT	Direct
0856U-04	Plate,Hot Strip,Skelp, Bar	CS-100	1926	915	4,847	4,847	4,847	PSP	CNT2-7.9, SSP,SS	OT	Direct
0856U-05	Plate,Hot Strip,Sheet, Skelp	CS-85 LA-15	1935	2,907	11,809	11,809	11,809	PSP	CNT2-61.4, SSP,SS	OT	Direct
0860B-01	Hot Strip	CS-96.5 SS-2 LA-1.5	1967	12,204	8,448	7,510	7,510	PSP,SS	CNT1-79.8, SSP,SS,FDSP, T,VF	RTP-(UNK), BD-(UNK)	Direct
0860B-02	Hot Strip	CS-100	1936 (1976)	5,895	5,594	5,594	5,594	PSP,SS	CNT1-20.2, SSP,SS, FDSP,T,VF	(RTP)	Direct
0864A	Plate,Hot Strip,Sheet	CS-94.8 LA-5.2	1944 (1971)	6,018	4,666	4,666	4,666	PSP	CNT2-50.4, CL,SS, SL(UNK)	RET-58.7, BD-41.3	Direct
0868A-02	Hot Strip	CS-100	1929	177	21,356	18,443	1,815	PSP	CNT2-5.4, SSP,SS, SL(UNK)	RUP-13.6, RTP-77.9, BD-8.5	Direct
0868A-03	Hot Strip	CS-99 LA-1	1937 (1969)	4,854	2,905	2,905	334	PSP	CNT2-23.3, SSP,SS, SL(UNK)	RTP-88.5, BD-11.5	Direct

TABLE III-4
GENERAL SUMMARY TABLE
HOT FORMING: FLAT-HOT STRIP AND SHEET
PAGE 6

Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity (Tons/Day)	Flow (Gallon/Ton) Applied	Flow (Gallon/Ton) Process	Flow (Gallon/Ton) Discharge	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0920C	Hot Strip	CS-99.5 LA-0.25 HCS-0.25	1953 (1964)	3,300	7,767	5,150	5,150	PSP,SS, SSP,SS (FP)	-	(RTP) RUP-(UNK), BD-(UNK)	Direct
0920N	Hot Strip	CS-96 LA-4	1966	7,992	[8200]	[5683]	[4860]	PSP,SS, FDMP	-	[RUP-30.7, RTP-10.1 BD-59.2]	Direct
0948A	Plate,Hot Strip,Sheet, Skelp	CS-89 LA-10 ES-1	1935 (1960)	7,584	6,076	6,076	6,076	PSP,SS	-	OT	Direct
0948C	Plate,Hot Strip,Sheet, Skelp	CS-95 LA-5	1968	8,724	6,602	6,602	6,602	PSP,SS	CNT2-97.6, FDSP,CL, FLO(1),SS	RET-100	Indirect

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* : Includes flows from one plate mill.
**: Confidential data.
( ) Dates in parentheses represent years in which the mill went through a major modification. Treatment components in parentheses represent treatment systems which were installed after January 1, 1978.
Data listed in brackets was received in the response to the detailed questionnaires or during sampling visits.

KEY TO C&TT STEPS

AS : Alloy Steel
CS : Carbon Steel
HCS: High Carbon Steel
SS : Stainless Steel

AT : Alloy Tool
ES : Electrical Steel
LA : Low Alloy
SAS: Super Alloy Steel

For definitions of C&TT codes see Table VII-1.

TABLE III-5

GENERAL SUMMARY TABLE
HOT FORMING: FLAT-PLATE (CARBON)

Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity (Tons/Day)	Flow (Gallon/Ton) Applied	Flow (Gallon/Ton) Process	Flow (Gallon/Ton) Discharge	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0060F-01	Plate	CS-73 LA-16 AS-11	1962	2,115	3,976	3,976	UNK	PSP	CNT2(UNK), SSP,Scr, SL(UNK),SS	RTP(UNK), RET(UNK), BD(UNK)	Direct
0060F-02	Plate	CS-73 LA-16 AS-11	1950	1,410	UNK	UNK	UNK	PSP	CNT2(UNK), SSP,SL(UNK), Scr,SS	RTP(UNK), RET(UNK) BD(UNK)	Direct
0112A-01	Plate	CS-100	1920 (1964)	1,056	2,455	2,455	2,455	PSP,SS	CNT2(UNK) SS,Scr,AE, NL,FLA,FLP, SL(UNK),CY,T	OT	Direct
0112A-02	Plate	CS-98 TS-2	1931 (1957)	2,592	2,778	2,778	2,778	PSP,SS	CNT2(UNK), Scr,AE,NL,SS, FLA,FLP,SL (UNK),CY,T	OT	Direct
0112C-01	Plate	CS-82.7 AS-17.3	1902 (1954)	834	UNK	UNK	UNK	PSP	CNT2(UNK), NC,AE,SSP,SS, T,FDS(UNK), CT	OT	Direct
0112C-02	Plate	CS-69.7 AS-30.3	1906 (1961)	471	UNK	UNK	UNK	PSP	CNT2(UNK), NC,AE,SSP,SS, T,FDS(UNK), CT	OT	Direct
0112D-01	Plate	CS-70 LA-15 AS-15	1964	3,360	[3240]	[3240]	[3240]	PSP,SS	CNT2-12.2, SS,CL,FLP, NL,NW,CR, SL(UNK)	OT	Direct
0384A-01	Plate	CS-74.7 LA-25.3	1913 (1951)	972	7,867	7,867	7,867	PSP,SSP, SS	CNT2-93, SL(UNK),SS	(RTP)	Direct

TABLE III-5
GENERAL SUMMARY TABLE
HOT FORMING: FLAT-PLATE (CARBON)
PAGE 2

Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity (Tons/Day)	Flow (Gallon/Ton) Applied	Flow (Gallon/Ton) Process	Flow (Gallon/Ton) Discharge	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0496 112"/120"	Plate	Carbon	1904 (1943)	1,740	[870]	[870]	[870]	PSP,SSP, SS	CNT1-28, FLP,DR,FDMG	OT	Direct
0496 140"	Plate	Carbon	1959 (1968)	1,830	[120]	[120]	[120]	PSP,SSP, SS	CNT1-4, FLP,DR,FDMG	OT	Direct
0684I-02	Plate	CS-76 LA-24	1967	1,629	7,558	7,558	6,889	PSP	CNT2-13.9, SSP,SS, BOA(1),NW, SL(UNK),SS	RTP-8.9, BD-91.1	Direct
0856H-01	Plate	CS-72.1 LA-27.9	1898	984	117	117	117	PSP,SSP, SS,(CT)	-	(RTP)	Direct
0856H-02	Plate	CS-87.4 LA-12.1 AT-0.5	1936	3,939	5,473	5,473	5,473	PSP,(CT)	-	(RTP)	Direct
0856H-03	Plate	CS-73.5 SS-1.5 LA-13.5 AT-11.5	1944	2,916	3,652	3,652	3,652	PSP,SS,(CT)	-	(RTP)	Direct
0860B-03	Plate	CS-67 AS-33	1962	3,162	2,550	2,550	2,550	PSP,SS (FP)	CNT2-7.5, SL(UNK), SS	(RTP)	Direct
0860H-01	Plate	CS-50 LA-42 AT-8	1907 (1973)	648	[9790]	[9790]	[360]	PSP,SS,(CT)	CNT2-5.3, Scr,CL,CT, T,FLL,VF,FLA SSP,SS	[RTP-96.3, BD-3.7]	POTW

TABLE III-5
GENERAL SUMMARY TABLE
HOT FORMING: FLAT-PLATE (CARBON)
PAGE 3

Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity (Tons/Day)	Flow (Gallon/Ton) Applied	Flow (Gallon/Ton) Process	Flow (Gallon/Ton) Discharge	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0860H-02	Plate, Floor Plate	CS-60 LA-40	1931	2,886	5,489	5,489	154	PSP,SS,(CT)	CNT2-14.7, Scr,SSP,SS CL,T,CT,FLL, VF,FLA	RTP-97.2, BD-2.8	POTW
0868A-01	Plate	CS-80 LA-20	1919 (1942)	1,800	3,922	3,922	451	PSP	CNT2-11.7, SL(UNK), SS,SSP	RTP-88.5, BD-11.5	Direct
0868B	Plate	CS-85 LA-10 AT-5	1970	3,894	4,992	4,992	185	PSP,SS	CNT2-99.3, FLP,A,SS, SSP,SL(UNK), F(UNK)(UNK)P	RTP-96.3, BD&Losses- 3.7	Direct

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( ) Dates in parentheses represent years in which the mill went through a major modification. Treatment components in parentheses represent treatment systems which were installed after January 1, 1978. Data listed in brackets was received in the responses to the detailed questionnaires or during sampling visits.

KEY TO C&TT STEPS

AS : Alloy Steel
CS : Carbon Steel
SS : Specialty Steel
TS : Titanium Steel
AT : Alloy Tool
LA : Low Alloy
SAS: Super Alloy Steel

NOTE: For definitions of C&TT codes see Table VII-1.

TABLE III-6

GENERAL SUMMARY TABLE
HOT FORMING: FLAT-PLATE (SPECIALTY)

Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity (Tons/Day)	Flow (Gallon/Ton) Applied	Flow (Gallon/Ton) Process	Flow (Gallon/Ton) Discharge	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0256L-01											
	CONFIDENTIAL DATA										
0256L-02											
0424-01	Plate	SS-78 AT-14 TS-8	1971	450	800	800	800	PSP,SS, SSP	CNT2-14, FDSP,SS, SL(UNK),CT	RET-61.5 BD-38.5	Direct
0496 (112"/ 120")	Plate	SS and LA	1904 (1943)	1,740	[2,653]	[2,653]	[2,653]	PSP,SSP, SS	CNT1-28, FLP,DR,FDMG	OT	Direct
0496 (140")	Plate	SS and LA	1959 (1968)	1,830	[870]	[870]	[870]	PSP,SSP, SS	CNT1-4, FLP,DR,FDMG	OT	Direct
0496 (140"/ 206")	Plate	SS and LA	1918	630	206	206	206	PSP,SSP, SS	CNT1-24, FLP,DR, FDMG	OT	Direct
0684V-01	Plate	SS-86 AS-14	1916	119.4	8,803*	8,803*	403*	PSP,SS, SL(UNK)	-	RTP-95.4, RET-4.6	Indirect
0776H-01	Plate	SS-10 LA-15 AT-75	1902	60	960	960	960	PSP	-	OT	Direct

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* : Includes flow from one sheet mill.

( ) Dates in parentheses represent years in which the mill went through a major modification. Treatment components in parentheses represent treatment systems which were installed after January 1, 1978.

Data listed in brackets was received in the responses to the detailed questionnaires or during sampling visits.

KEY TO C&TT STEPS

AS : Alloy Steel
CS : Carbon Steel
SS : Specialty Steel
TS : Titanium Steel

AT : Alloy Tool
LA : Low Alloy
SAS: Super Alloy Steel

For definitions of C&TT codes see Table VII-1.

TABLE III-7

GENERAL SUMMARY TABLE
HOT WORKING PIPE AND TUBE

Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity (Tons/Day)	Flow (Gallon/Ton)			Treatment Components		Operating Mode	Discharge Mode
					Applied	Process	Discharge	Process Treatment	Central Treatment		
0060C 01	Seamless Pipe	CS - 60 HSLA - 40	1913	906	UNK	UNK	UNK	PSP, SS	CNT 2(UNK), FLP,SSP, SS	RTP(UNK), BD(UNK)	Direct
0060C 02	Seamless Pipe	CS-45 HSLA-55	1913	408	UNK	UNK	UNK	PSP,SS	CNT2(UNK), FLP,SSP, SS	RTP(UNK), BD(UNK)	Direct
0060F	Butt Weld Pipe	CS-10 HSLA-90	1950	1044	(No production in 1976)			-	-	-	-
0088A 01	Seamless Tube	CS-14.0 SS-3.5 HSLA-40.0 CMHR-42.5	1914	285	UNK	UNK	UNK	PSP	CNT 1(UNK), SSP,SS, Straw Filter (VF)	(RTP)	Direct
0088A 02	Seamless Pipe	CS-10.5 HSLA-40.0 CMHR-49.5	1917	252	UNK	UNK	UNK	PSP	CNT 1(UNK), SSP,SS, Straw Filter	(RTP)	Direct
0088A 03	Seamless Tube	CS-7 HSLA-93	1932	171	2712	2712	2712	PSP	-	OT	Direct
0088C 01	Seamless Tube	CS-60 HSLA-40	1910	283.8	3552	3552	1369	PSP,SSP, SS	CNT 2-33.7, GF,CY,(VF), (FP),(CT)	RTP-61.4, BD-38.6	Direct
0088C 02	Seamless Tube	CS-60 HSLA-40	1937	268.5	6436	6436	2481	PSP,SSP, SS			
0112A 01	Butt Weld Pipe	CS-100	1939	366	UNK	UNK	UNK	PSP,SS	CNT2(UNK), Scr,NL, A,FLA,FLP, SL(UNK),SS, T,CY	OT	Direct

TABLE III-7
GENERAL SUMMARY TABLE
HOT WORKING PIPE AND TUBE
PAGE 2

Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity (Tons/Day)	Flow (Gallon/Ton)			Treatment Components		Operating Mode	Discharge Mode
					Applied	Process	Discharge	Process Treatment	Central Treatment		
0112A 02	Butt Weld Pipe	CS-100	1940	744	UNK	UNK	UNK	PSP,SS	CNT2(UNK), Scr,NL,A, FLA,FLP, SL(UNK),SS, T,CY	OT	Direct
0196A	Seamless Tube	CS-95 HSLA-5	1953	**	12,794	12,794	4,572	PSP,SS	CNT2-32.9, SSP,SS, SL(UNK), CL,FDSP,CT	BD-35.7 RTP-64.3	Direct
0240B 05	Seamless Pipe	CS-34 AS-66	1925	213	[1700]	[1700]	[0]	PSP,Oil Separator	SL(UNK)	RTP-100	Direct
0256G	Butt Weld Pipe	CS-97 HSLA-3	1958	564	[515]	[515]	[515]	PSP,SSP, SS	-	OT	Direct
0396E	Butt Weld Pipe	CS-80 AS-20	1947	480	450	450	41	-	CNT2-1.8 SL(UNK)	RTP-91, BD-9.0	Direct
0432A 01	Butt Weld Pipe and Welded Tube	CS-100	1957	699	[8080]	[8080]	[8080]	PSP,SS	CNT 2(11.6) FLP,FLM, CL,SS,Scr, VF	OT	Direct
0432A 02	Butt Weld Pipe and Welded Tube	CS-100	1958	1029.6	UNK	UNK	UNK	PSP,SS	CNT 2(UNK), FLP,FLM, CL,SS,Scr, VF	OT	Direct
0432A 03	Seamless Pipe	CS-70 HSLA-30	1927	828	UNK	UNK	UNK	PSP	-	OT	Direct

TABLE III-7
GENERAL SUMMARY TABLE
HOT WORKING PIPE AND TUBE
PAGE 3

Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity (Tons/Day)	Flow (Gallon/Ton)			Treatment Components		Operating Mode	Discharge Mode
					Applied	Process	Discharge	Process Treatment	Central Treatment		
0432A 04	Seamless Pipe and Tube	CS-70 HSLA-30	1928	516	UNK	UNK	UNK	PSP	-	OT	Direct
0448A	Butt Weld Pipe	CS-100	1948	456.3	UNK	UNK	UNK	PSP,SS	CNT 2(UNK), CL,SL(UNK), CT	RUP(UNK), RTP(UNK), BD(UNK)	Direct
0476A	Butt Weld Pipe	CS-100	1930	381.6	4672	887	887	PSP	CNT2-9.9, Scr,SS,NL, CY,FLP,CL	RUP-78.7, BD-19.1, Losses 2.2	Direct
0492A 05	Seamless Tube	CS-5 HSLA-95	1975	156	10154	10154	8237	PSP,SSP, SS	CNT2-1.4, SL(UNK), SS	RTP-18.9, RET-81.1	Indirect:no discharge from total system
0548	Seamless Tube	CS-90 AS-10	1945	196.8	4573	915	915	PSP	CNT2-27.1, NL,SL(UNK), GF,FLL,NA	RUP-80, BD-20	Direct
0548A 01	Seamless Pipe	CS-70 LA-30	1960	126	8000	8000	1794	PSP,SSP, SS	CNT2-77.8, Spray Cooling	RTP-77.6 RET-22.3 BD-0.1	Direct
0548A 02	Seamless Pipe and Tube	CS-70 LA-30	1957	42	6857	6857	3429	-	CNT 2-22.2, Spray Cooling	RTP-50, RET-49, BD-1	Direct
0652A	Seamless Tube	CS-83 HSLA-17	1954	363	[3672]	[3672]	[3672]	PSP,SSP, SS	-	OT	Direct
0684A 02	Butt Weld Pipe	CS-100	1966	1002	4311	4311	4311	PSP,SS	-	OT	Direct

TABLE III-7
GENERAL SUMMARY TABLE
HOT WORKING PIPE AND TUBE
PAGE 4

Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity (Tons/Day)	Flow (Gallon/Ton)			Treatment Components		Operating Mode	Discharge Mode
					Applied	Process	Discharge	Process Treatment	Central Treatment		
0684H	Seamless Tube	CS-50 HSLA-50	1953	540	[7010]	[7010]	[21]	PSP,SS	CNT2-8.9, FDSP,VF, FLL,FLP, CT,CL,T	[RTP-99.7]	POTW
0728	Butt Weld Pipe	CS-100	1929	240	[2560]	[2560]	[82]	-	CNT 2-96.8, PSP,SSP, SL(UNK),CT	RTP-96.8, RET-3.2	Indirect-Complete Recycle and Reuse
0796A 01	*	*	*	*	*	*	*	*	*	*	*
0796A 02	*	*	*	*	*	*	*	*	*	*	*
0796A 03	*	*	*	*	*	*	*	*	*	*	*
0796B	*	*	*	*	*	*	*	*	*	*	*
0856C	Seamless Pipe	CS-90 HSLA-1 AS-9	1972	36	1,667	83	83	PSP	-	RUP-95, BD-5	Direct
0856F 01	Butt Weld Pipe	CS-100	1953	663							
					7,111	3,556	3,556	PSP	CNT2-6.7, CF,SSP>FLP, BOA(1), SL(UNK),SS	RUP-50 BD-50	Direct
0856F 02	Butt Weld Pipe	CS-100	1963	957							
0856N 01	Seamless Pipe	CS-100	1928	1011	3418	3418	3418	PSP	CNT 2-9.4, SL(UNK),SS	OT	Direct

TABLE III-7
GENERAL SUMMARY TABLE
HOT WORKING PIPE AND TUBE
PAGE 5

Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity (Tons/Day)	Flow (Gallon/Ton) Applied	Flow (Gallon/Ton) Process	Flow (Gallon/Ton) Discharge	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0856N 02	Seamless Pipe	CS-85 HSLA-15	1930	1500	3648	3648	3648	-	CNT2-10.7, SL(UNK), SS	OT	Direct
0856N 03	Seamless Pipe	CS-90 HSLA-10	1949	981	3083	3083	3083	PSP	CNT 2-5.9, SL(UNK), SS	OT	Direct
0856N 04	Butt Weld Pipe	CS-100	1960	888	3730	3730	3730	PSP	CNT 2-6.5, SL(UNK), SS	OT	Direct
0856Q 01	Seamless Pipe	CS-100	1930	927	UNK	UNK	UNK	PSP,SSP	CNT 2(UNK), SL(UNK),SS	OT	Direct
0856Q 02	Seamless Pipe	CS-100	1930	1365	UNK	UNK	UNK	PSP,SSP	CNT 2(UNK), SL (UNK), SS	OT	Direct
0916A 01	Butt Weld Pipe	CS-100	1931	600	2765	2765	2765	PSP,SS, FD(UNK) P, SL(UNK)	-	OT	Direct
0920C 01	Seamless Tube	CS-85 HSLA-15	1934	229.5	4706	4235	4235	PSP	CNT 2-19.7, NC,SSP, SS	(RTP)	Direct
0920C 02	Seamless Tube	CS-85 HSLA-15	1945	373.2	5788	5209	5209	PSP	CNT 2-39.5, NC,SSP,SS	(RTP)	Direct
0920C 03	Seamless Tube	CS-85 HSLA-15	1924	111.3	Not in Operation in 1976 NA	NA	NA	PSP	CNT 2-19.7, NC,SSP,SS	(RTP)	Direct

TABLE III-7
GENERAL SUMMARY TABLE
HOT WORKING PIPE AND TUBE
PAGE 6

Plant Code	Product	Steel Type	Age - 1st Year of Prod.	Production Capacity (Tons/Day)	Flow (Gallon/Ton)			Treatment Components		Operating Mode	Discharge Mode
					Applied	Process	Discharge	Process Treatment	Central Treatment		
0948A 01	Seamless Tube	CS-60 HSLA-40	1926	615	6207	6207	6207	PSP	CNT 1-60, SSP,SS	OT	Direct
0948A 02	Seamless Tube	CS-70 HSLA-30	1926	777							
0948A 03	Butt Weld Pipe	CS-97 AT-3	1939	468	3077	3077	3077	PSP	-	OT	Direct
0948C 01	Seamless Pipe	CS-80 HSLA-20	1957	444	21.405	21,405	21,405	PSP,SS	-	OT	Direct
0948C 02	Butt Weld Pipe	CS-90 AT-10	1950	501	6611	6611	6611	PSP,SSP, SS,FDSP	-	OT	Direct

---

NOTE: For the definition of the treatment component symbols, refer to Table VII-1.
* : Confidential Information
() : Treatment components in parentheses represent treatment systems which were installed after 1/1/78.

TABLE III-8

HOT FORMING-PRIMARY
CARBON AND SPECIALTY STEELS
DATA BASE

	No. of Operations	% of Total No. of Operations	Daily Capacity(1) of Operations (Tons)	Total Daily Capacity
Operations Sampled for Original Study	13	10.0	46,086	10.0
Operations Sampled for 1977 Toxic Pollutant Study	5 incl.	3.9 incl.	14,394 incl.	3.1 incl.
	1 above	0.8 above	5,565 above	1.2 above
Operations Sampled for 1980 Toxic Metals Survey	9 incl.	6.9 incl.	50,376 incl.	11.0 incl.
	1 above	0.8 above	2,322 above	0.5 above
Total Operations Sampled	25	19.2	102,969	22.4
Operations Selected for D-DCP	9 incl.	6.9	42,993	9.3
	3 above	2.3	16,608	3.6
Operations Sampled and/or Solicited via D-DCP	31	23.8	129,354	28.1
Operations Responding to DCP	111(2)	85(3)	423,332	92.0
Estimated Number of Hot Forming-Primary Operations	130	100	460,000	100

---

(1) 1976 capacity
(2) Responses were received for 114 operations, three of which were reported to be idle. Data are included in the totals for five operations with confidential data.
(3) Responses were solicited and received from approximately 85% of all active Hot Forming - Primary operations.

TABLE III-9

HOT FORMING SECTION
CARBON AND SPECIALTY STEELS
DATA BASE

	No. of Operations	% of Total No. of Operations	Daily Capacity[1] of Operations (Tons)	% of Total Daily Capacity
Operations sampled for original guidelines study	25	8.9	15,752	5.7
Operations sampled for 1977 toxic pollutant study	13 incl. 4 above	4.6 incl. 1.4 above	15,581 incl. 287 above	5.6 incl. 0.1 above
Operations sampled for 1980 toxic metals survey	10 incl. 1 above	3.5 incl. 0.4 above	18,672 incl. 948 above	6.7 incl. 0.3 above
Total operations sampled	43	15.2	48,770	17.5
Operations selected for detailed DCP	10 incl. 2 above	3.5 incl. 0.7 above	8942 incl. 3765 above	3.2 incl. 1.4 above
Operations sampled and/or solicited via detailed DCP	51	18.1	53,947	19.4
Operations responding to basic DCP	240(2)	85(3)	236,809	85
Estimated number of hot forming section operations	282	100	278,599	100

---

(1) 1976 capacities were used for the values in this column.

(2) Responses from 242 operations were received; however, two of those operations were reported to be idle. This number includes confidential operations.

(3) It has been estimated that responses have been received from 85% of the active section operations in the United States.

TABLE III-10

HOT FORMING FLAT
HOT STRIP AND SHEET
CARBON AND SPECIALTY STEELS
DATA BASE

	No. of Operations	% of Total No. of Operations	Daily Capacity(1) of Operations (Tons)	% of Total Daily Capacity
Operations sampled for original guidelines study	7	10.8	40,455	13.2
Operations sampled for 1977 toxic pollutant study	2	3.1	17,694	5.8
Operations sampled for 1980 toxic metals survey	8 incl. 3 above	12.3 incl. 4.6 above	74,635 incl. 27,498 above	24.4 incl. 9.0 above
Total operations sampled	14	21.5	105,286	34.4
Operations selected for detailed DCP	7 incl. 5 above	10.8 incl. 7.7 above	48,795 incl. 35,064 above	15.9 incl. 11.4 above
Operations sampled and/or solicited via detailed DCP	16	24.6	119,017	38.9
Operations responding to basic DCP	55(2)	85(3)	260,324	85.0
Estimated number of hot forming flat operations	65	100.0	306,264	100.0

---

(1) 1976 capacities were used for the values in this column.

(2) Responses from 57 operations were received, however, 2 of these operations were reported to be idle. This number includes confidential plants.

(3) It has been estimated that responses have been received from approximately 85% of the active flat operations in the United States.

TABLE III-11

HOT FORMING FLAT
PLATE
CARBON AND SPECIALTY STEELS
DATA BASE

	No. of Operations	% of Total No. of Operations	Daily Capacity[1] of Operations (Tons)	% of Total Daily Capacity
Operations sampled for original guidelines study	2	6.3	6810	16.3
Operations sampled for 1977 toxic pollutant study	7	21.9	15,948	38.3
Operations sampled for 1980 toxic metals survey	1 incl. 1 above	3.1 incl. 3.1 above	3,360 incl. 3,360 above	8.1 incl. 8.1 above
Total operations sampled	9	28.1	22,758	54.6
Operations selected for detailed DCP	2	6.3	2537	6.1
Operations sampled and/or solicited via detailed DCP	11	34.4	25,295	60.7
Operations responding to basic DCP	27	85[2]	35,414	85.0
Estimated number of hot forming flat operations	32	100.0	41,664	100.0

---

(1) 1976 capacities were used for the values in this column.

(2) It has been estimated that responses have been received from approximately 85% of the active flat operations in the United States.

TABLE III-12

HOT WORKING PIPE AND TUBE CARBON AND SPECIALTY STEELS DATA BASE

	Number of Operations	% of Total Number of Operations	Daily Capacity(1) of Operations (Tons)	% of Total Daily Capacity
Operations sampled for original study	5	8.2	2,439	7.9
Operations sampled for 1977 toxic pollutant study	2	3.3	1,239	4.0
Operations sampled for 1980 toxic metals survey	3	4.9	2,892	9.4
Total number of operations sampled	10	16.4	6,570	21.3
Operations selected for the detailed DCP	3 incl. 2 above	4.9 incl. 3.3 above	816 incl. 453 above	2.6 incl. 1.5 above
Operations sampled and/or solicited via detailed DCP	13 incl.	21.3 incl.	7,386	24.0
Operations responding to the basic DCP	52(2)	85(3)	26,202(4)	85
Estimated number of hot working pipe and tube operations	61	100	30,826	100

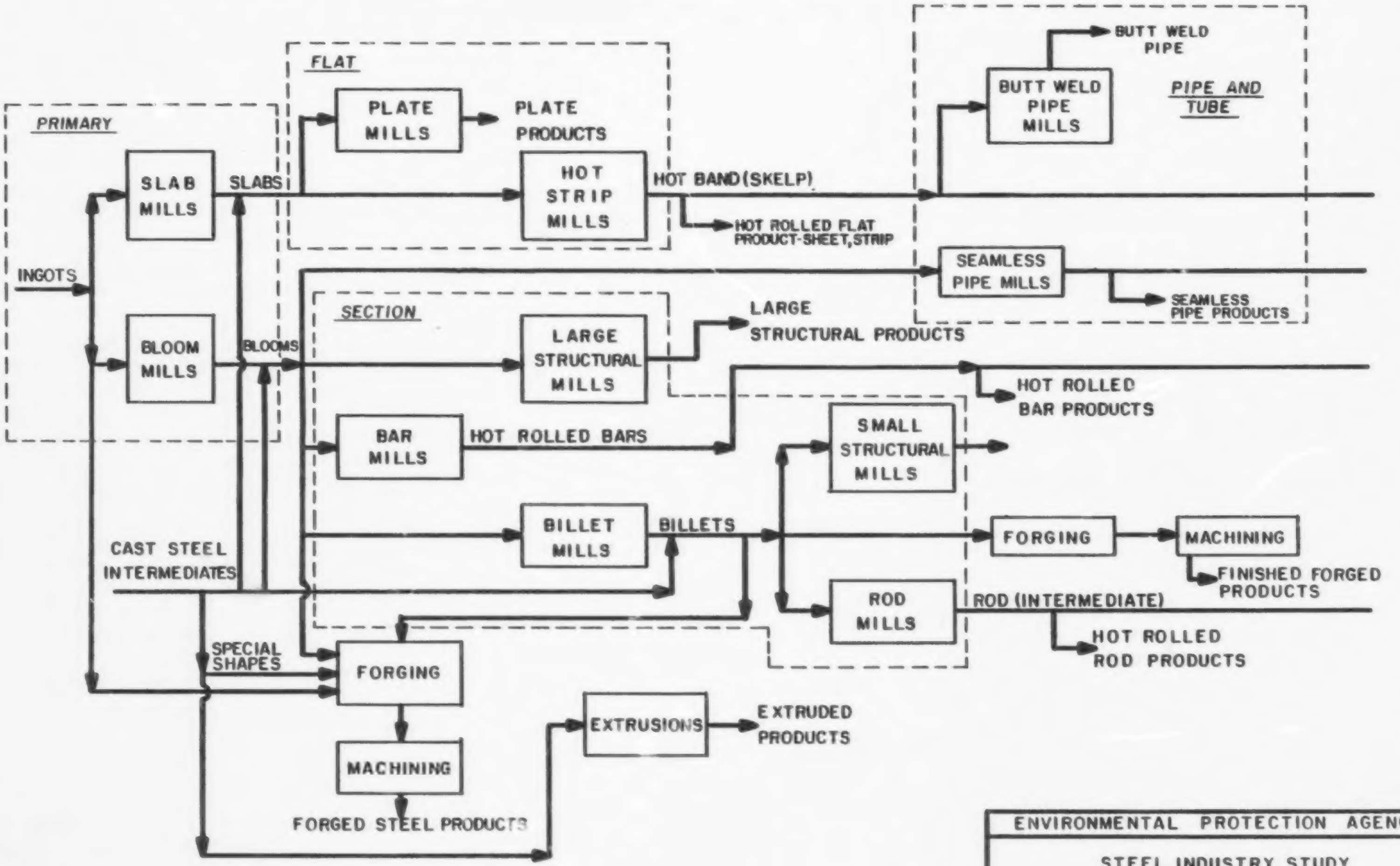
---

(1) 1976 capacity

(2) Includes two operations reported as idle.

(3) It has been estimated that responses were received from 85% of the hot working pipe and tube operations in the United States.

(4) This number does not include data from the two operations reported as idle.

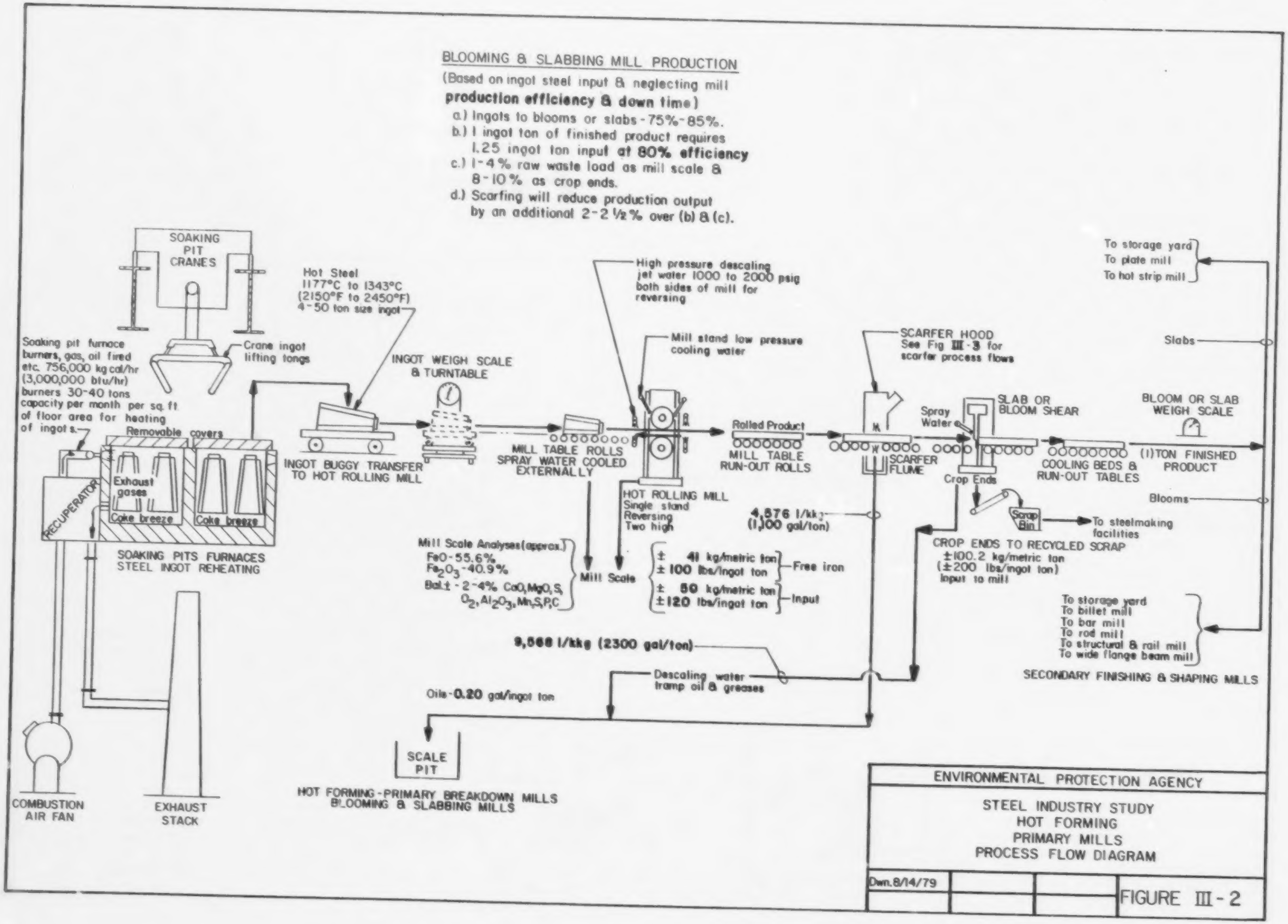

PRIMARY
INGOTS
SLAB MILLS
SLABS
BLOOM MILLS
BLOOMS
FLAT
PLATE MILLS
PLATE PRODUCTS
HOT STRIP MILLS
HOT BAND (SKELP)
HOT ROLLED FLAT PRODUCT-SHEET, STRIP
PIPE AND TUBE
BUTT WELD PIPE MILLS
BUTT WELD PIPE
SEAMLESS PIPE MILLS
SEAMLESS PIPE PRODUCTS
SECTION
LARGE STRUCTURAL MILLS
LARGE STRUCTURAL PRODUCTS
BAR MILLS
HOT ROLLED BARS
HOT ROLLED BAR PRODUCTS
SMALL STRUCTURAL MILLS
BILLET MILLS
BILLETS
FORGING
MACHINING
FINISHED FORGED PRODUCTS
ROD MILLS
ROD (INTERMEDIATE)
HOT ROLLED ROD PRODUCTS
CAST STEEL INTERMEDIATES
SPECIAL SHAPES
FORGING
MACHINING
FORGED STEEL PRODUCTS
EXTRUSIONS
EXTRUDED PRODUCTS

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING
PROCESS FLOW DIAGRAM

Dwn. 4/25/79

FIGURE III-1.



BLOOMING & SLABBING MILL PRODUCTION

(Based on ingot steel input & neglecting mill **production efficiency & down time**)

a.) Ingots to blooms or slabs - 75% - 85%.
b.) 1 ingot ton of finished product requires 1.25 ingot ton input **at 80% efficiency**
c.) 1 - 4% raw waste load as mill scale & 8 - 10% as crop ends.
d.) Scarfing will reduce production output by an additional 2 - 2 1/2% over (b) & (c).

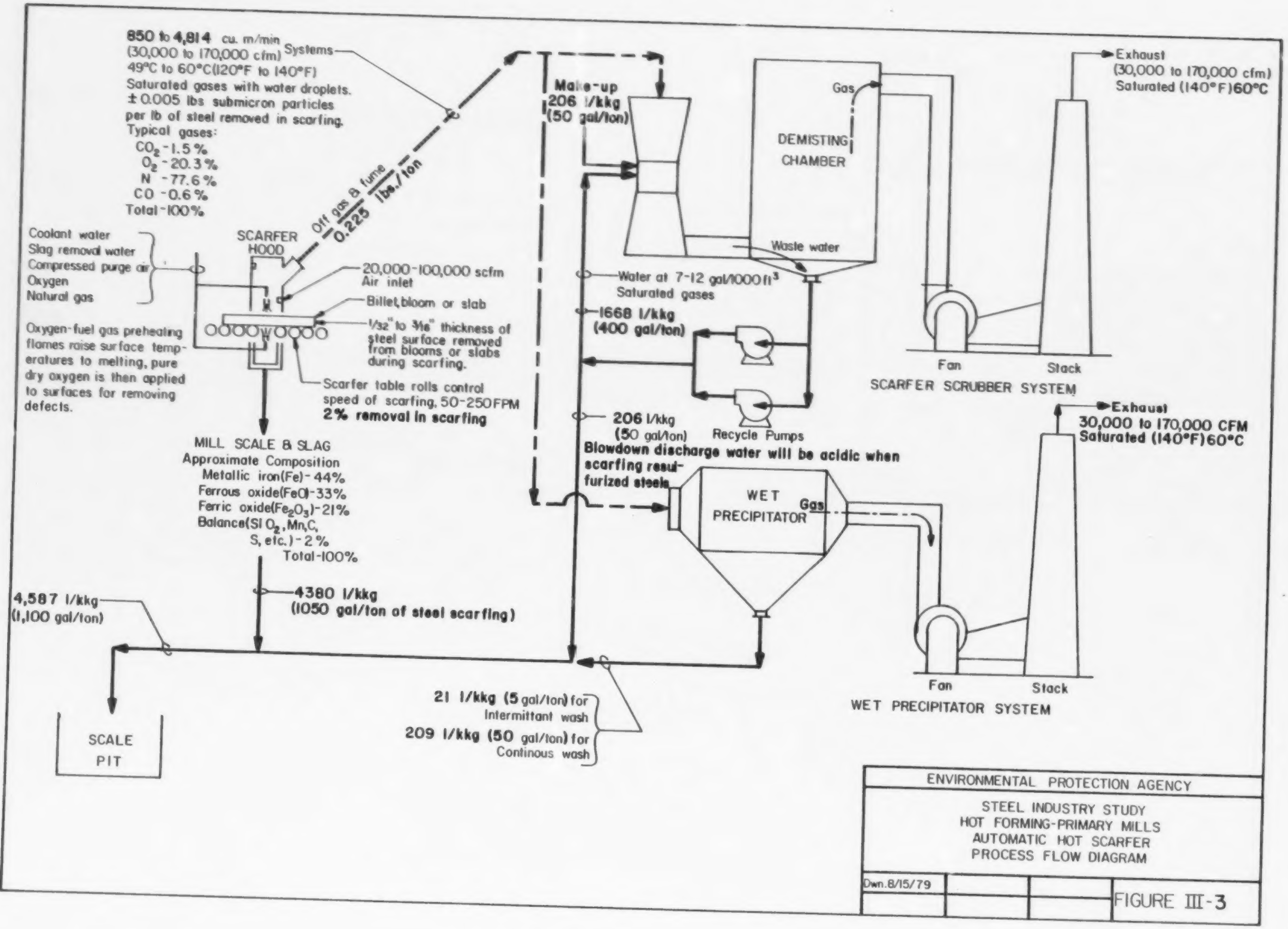
SOAKING PIT CRANES
Hot Steel
1177°C to 1343°C
(2150°F to 2450°F)
4 - 50 ton size ingot
Soaking pit furnace burners, gas, oil fired etc. 756,000 kg cal/hr (3,000,000 btu/hr) burners 30-40 tons capacity per month per sq. ft of floor area for heating of ingots.
Crane ingot lifting tongs
Removable covers
RECUPERATOR
Exhaust gases
Coke breeze
Coke breeze
SOAKING PITS FURNACES
STEEL INGOT REHEATING
INGOT BUGGY TRANSFER TO HOT ROLLING MILL
INGOT WEIGH SCALE & TURNTABLE
MILL TABLE ROLLS SPRAY WATER COOLED EXTERNALLY
High pressure descaling jet water 1000 to 2000 psig both sides of mill for reversing
Mill stand low pressure cooling water
HOT ROLLING MILL
Single stand
Reversing
Two high
Rolled Product
MILL TABLE RUN-OUT ROLLS
SCARFER HOOD
See Fig III-3 for scarfer process flows
SCARFER FLUME
Spray Water
SLAB OR BLOOM SHEAR
Crop Ends
Scrap Bin
To steelmaking facilities
CROP ENDS TO RECYCLED SCRAP
±100.2 kg/metric ton
(±200 lbs/ingot ton)
Input to mill
COOLING BEDS & RUN-OUT TABLES
BLOOM OR SLAB WEIGH SCALE
(1) TON FINISHED PRODUCT
Slabs
Blooms
To storage yard
To plate mill
To hot strip mill
To storage yard
To billet mill
To bar mill
To rod mill
To structural & rail mill
To wide flange beam mill
SECONDARY FINISHING & SHAPING MILLS
Mill Scale Analyses (approx.)
FeO - 55.6%
Fe2O3 - 40.9%
Bal. ± - 2 - 4% CaO, MgO, S, O2, Al2O3, Mn, S, P, C
Mill Scale
± 41 kg/metric ton
± 100 lbs/ingot ton
Free iron
± 50 kg/metric ton
± 120 lbs/ingot ton
Input
4,576 l/kkg
(1,100 gal/ton)
9,568 l/kkg (2300 gal/ton)
Descaling water tramp oil & greases
Oils - 0.20 gal/ingot ton
SCALE PIT
COMBUSTION AIR FAN
EXHAUST STACK
HOT FORMING - PRIMARY BREAKDOWN MILLS
BLOOMING & SLABBING MILLS

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING
PRIMARY MILLS
PROCESS FLOW DIAGRAM

Dwn. 8/14/79

FIGURE III - 2

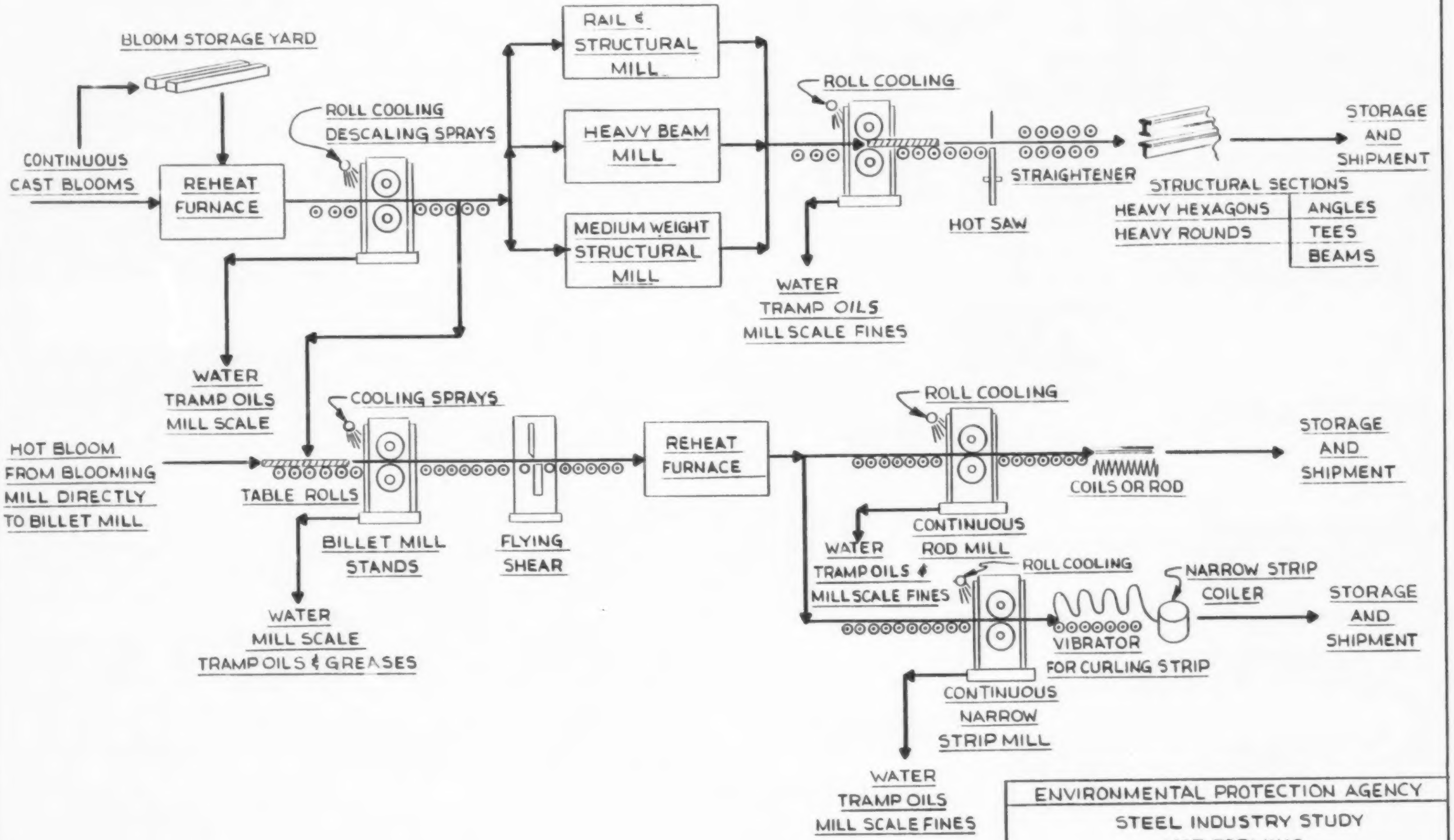

850 to 4,814 cu. m/min
(30,000 to 170,000 cfm) Systems
49°C to 60°C(120°F to 140°F)
Saturated gases with water droplets.
± 0.005 lbs submicron particles per lb of steel removed in scarfing.
Typical gases:
CO2 - 1.5 %
O2 - 20.3 %
N - 77.6 %
CO - 0.6 %
Total - 100%
Off gas & fume
0.225 lbs./ton
Coolant water
Slag removal water
Compressed purge air
Oxygen
Natural gas
SCARFER HOOD
20,000-100,000 scfm Air inlet
Billet, bloom or slab
1/32" to 3/16" thickness of steel surface removed from blooms or slabs during scarfing.
Oxygen-fuel gas preheating flames raise surface temperatures to melting, pure dry oxygen is then applied to surfaces for removing defects.
Scarfer table rolls control speed of scarfing, 50-250 FPM
2% removal in scarfing
MILL SCALE & SLAG
Approximate Composition
Metallic iron(Fe) - 44%
Ferrous oxide(FeO) - 33%
Ferric oxide(Fe2O3) - 21%
Balance(SiO2, Mn, C, S, etc.) - 2%
Total - 100%
4,587 l/kkg
(1,100 gal/ton)
4380 l/kkg
(1050 gal/ton of steel scarfing)
SCALE PIT
Make-up
206 l/kkg
(50 gal/ton)
Water at 7-12 gal/1000 ft3
Saturated gases
1668 l/kkg
(400 gal/ton)
206 l/kkg
(50 gal/ton)
Blowdown discharge water will be acidic when scarfing resulfurized steels
Recycle Pumps
Gas
DEMISTING CHAMBER
Waste water
Fan
Stack
SCARFER SCRUBBER SYSTEM
Exhaust
(30,000 to 170,000 cfm)
Saturated (140°F) 60°C
WET PRECIPITATOR
Gas
Exhaust
30,000 to 170,000 CFM
Saturated (140°F) 60°C
Fan
Stack
WET PRECIPITATOR SYSTEM
21 l/kkg (5 gal/ton) for Intermittant wash
209 l/kkg (50 gal/ton) for Continous wash

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING-PRIMARY MILLS
AUTOMATIC HOT SCARFER
PROCESS FLOW DIAGRAM

Dwn. 8/15/79

FIGURE III-3


BLOOM STORAGE YARD
CONTINUOUS CAST BLOOMS
REHEAT FURNACE
ROLL COOLING
DESCALING SPRAYS
RAIL & STRUCTURAL MILL
HEAVY BEAM MILL
MEDIUM WEIGHT STRUCTURAL MILL
ROLL COOLING
HOT SAW
STRAIGHTENER
STORAGE AND SHIPMENT
STRUCTURAL SECTIONS
HEAVY HEXAGONS
HEAVY ROUNDS
ANGLES
TEES
BEAMS
WATER
TRAMP OILS
MILL SCALE FINES
WATER
TRAMP OILS
MILL SCALE
HOT BLOOM FROM BLOOMING MILL DIRECTLY TO BILLET MILL
COOLING SPRAYS
TABLE ROLLS
BILLET MILL STANDS
FLYING SHEAR
REHEAT FURNACE
WATER
MILL SCALE
TRAMP OILS & GREASES
ROLL COOLING
COILS OR ROD
STORAGE AND SHIPMENT
CONTINUOUS ROD MILL
WATER
TRAMP OILS &
MILL SCALE FINES
ROLL COOLING
NARROW STRIP COILER
STORAGE AND SHIPMENT
VIBRATOR FOR CURLING STRIP
CONTINUOUS NARROW STRIP MILL
WATER
TRAMP OILS
MILL SCALE FINES

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING
SECTION MILLS
PROCESS FLOW DIAGRAM

DWG 3-13-74
REV 1 2-23-76

FIGURE III-4

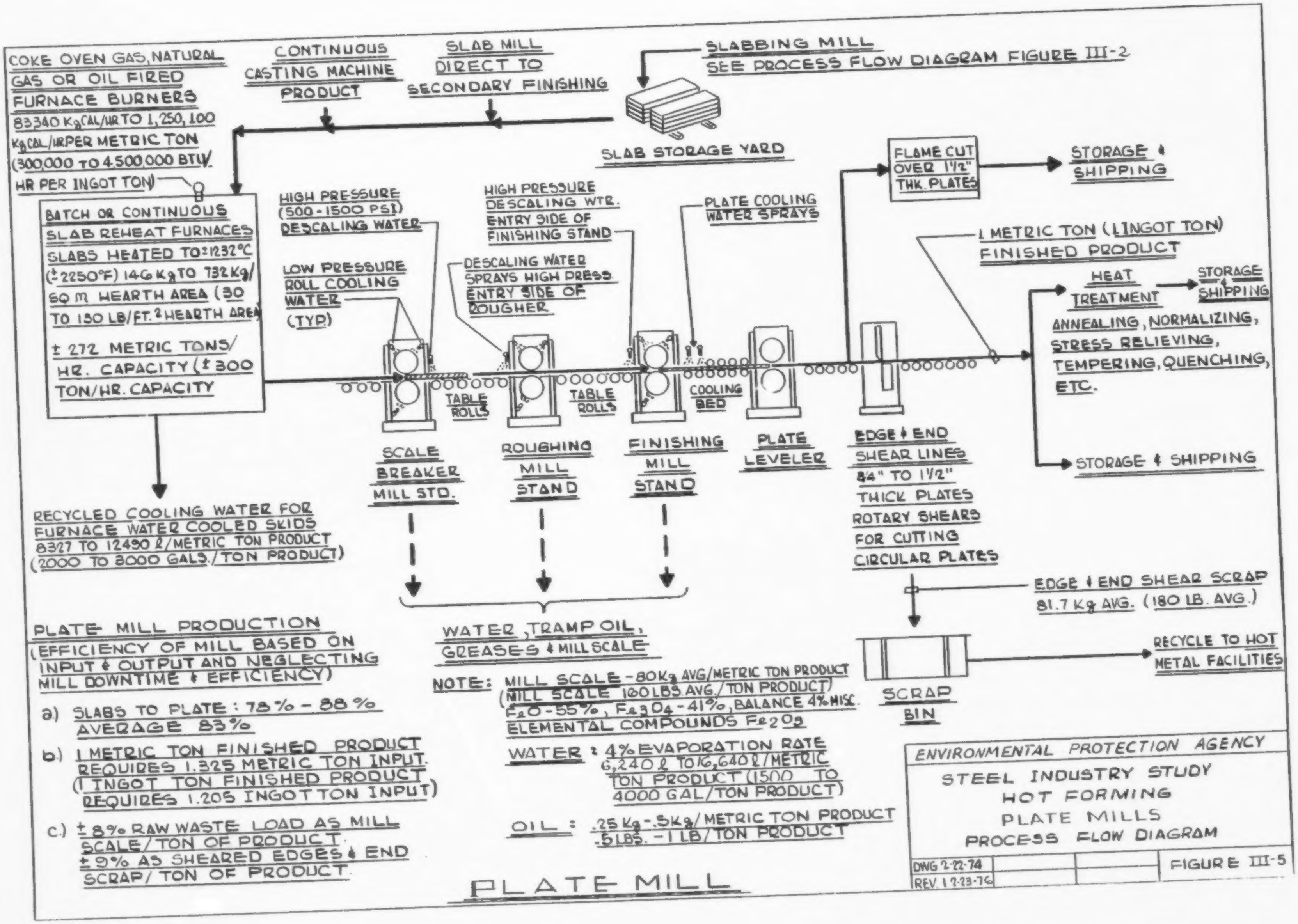

COKE OVEN GAS, NATURAL GAS OR OIL FIRED FURNACE BURNERS
83340 Kg CAL/HR TO 1,250,100 Kg CAL/HR PER METRIC TON (300,000 TO 4,500,000 BTU/HR PER INGOT TON)
CONTINUOUS CASTING MACHINE PRODUCT
SLAB MILL DIRECT TO SECONDARY FINISHING
SLABBING MILL SEE PROCESS FLOW DIAGRAM FIGURE III-2
SLAB STORAGE YARD
BATCH OR CONTINUOUS SLAB REHEAT FURNACES
SLABS HEATED TO ± 1232°C (± 2250°F) 146 Kg TO 732 Kg/SQ m HEARTH AREA (30 TO 150 LB/FT.² HEARTH AREA)
± 272 METRIC TONS/HR. CAPACITY (± 300 TON/HR. CAPACITY
HIGH PRESSURE (500-1500 PSI) DESCALING WATER
LOW PRESSURE ROLL COOLING WATER (TYP)
DESCALING WATER SPRAYS HIGH PRESS. ENTRY SIDE OF ROUGHER
HIGH PRESSURE DESCALING WTR. ENTRY SIDE OF FINISHING STAND
PLATE COOLING WATER SPRAYS
TABLE ROLLS
TABLE ROLLS
COOLING BED
SCALE BREAKER MILL STD.
ROUGHING MILL STAND
FINISHING MILL STAND
PLATE LEVELER
EDGE & END SHEAR LINES 3/4" TO 1 1/2" THICK PLATES ROTARY SHEARS FOR CUTTING CIRCULAR PLATES
FLAME CUT OVER 1 1/2" THK. PLATES
STORAGE & SHIPPING
1 METRIC TON (1 INGOT TON) FINISHED PRODUCT
HEAT TREATMENT
STORAGE & SHIPPING
ANNEALING, NORMALIZING, STRESS RELIEVING, TEMPERING, QUENCHING, ETC.
STORAGE & SHIPPING
EDGE & END SHEAR SCRAP 81.7 Kg AVG. (180 LB. AVG.)
SCRAP BIN
RECYCLE TO HOT METAL FACILITIES
RECYCLED COOLING WATER FOR FURNACE WATER COOLED SKIDS 8327 TO 12490 ℓ/METRIC TON PRODUCT (2000 TO 3000 GALS./TON PRODUCT)
WATER, TRAMP OIL, GREASES & MILL SCALE
PLATE MILL

PLATE MILL PRODUCTION
(EFFICIENCY OF MILL BASED ON INPUT & OUTPUT AND NEGLECTING MILL DOWNTIME & EFFICIENCY)

a) SLABS TO PLATE: 78% - 88% AVERAGE 83%

b) 1 METRIC TON FINISHED PRODUCT REQUIRES 1.325 METRIC TON INPUT. (1 INGOT TON FINISHED PRODUCT REQUIRES 1.205 INGOT TON INPUT)

c) ± 8% RAW WASTE LOAD AS MILL SCALE/TON OF PRODUCT. ± 9% AS SHEARED EDGES & END SCRAP/TON OF PRODUCT.

NOTE: MILL SCALE - 80 Kg AVG/METRIC TON PRODUCT (MILL SCALE 160 LBS. AVG./TON PRODUCT) FeO - 55%, Fe_3O_4 - 41%, BALANCE 4% MISC. ELEMENTAL COMPOUNDS Fe_2O_3

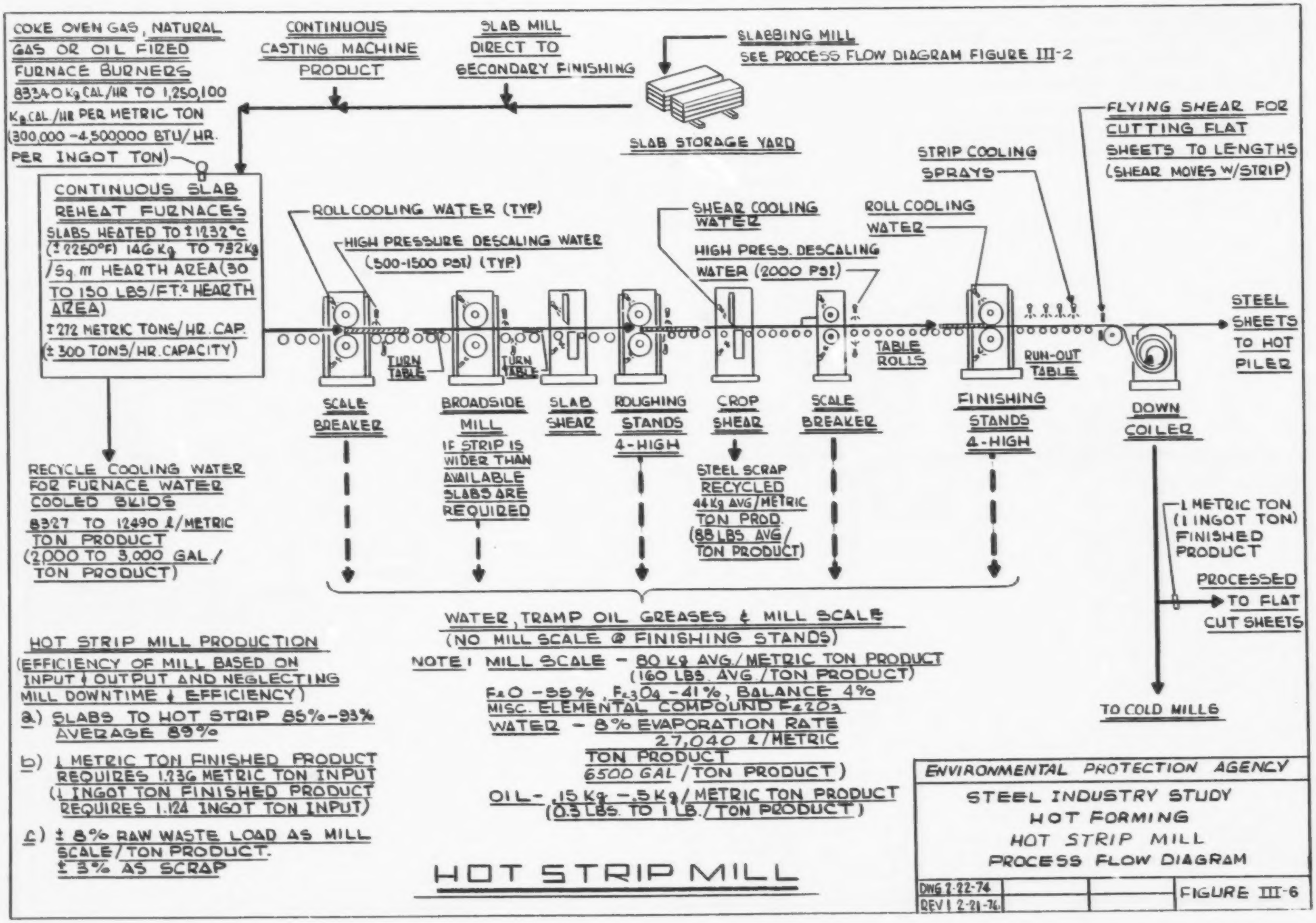
WATER: 4% EVAPORATION RATE 6,240 ℓ TO 16,640 ℓ/METRIC TON PRODUCT (1500 TO 4000 GAL/TON PRODUCT)

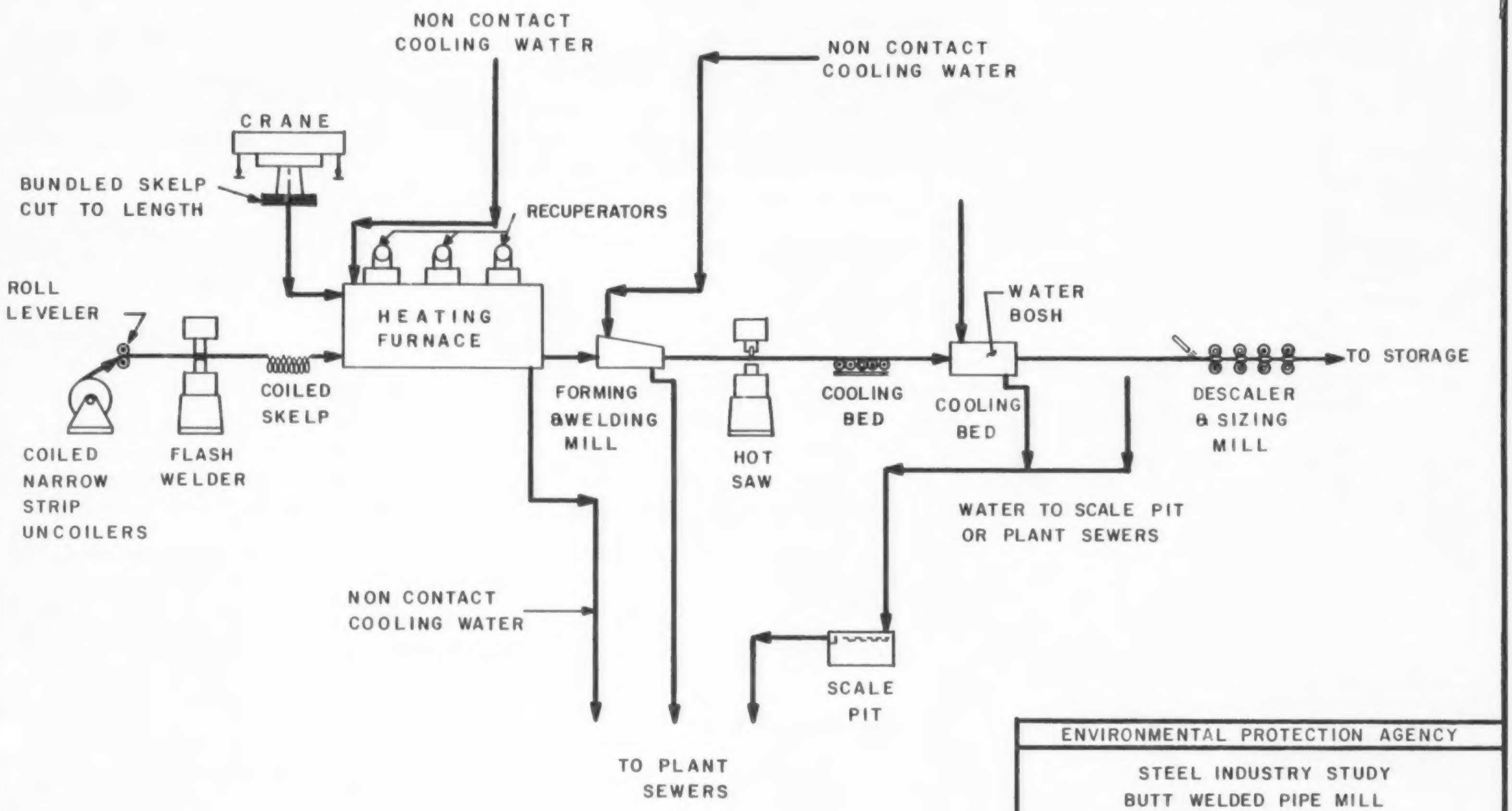
OIL: .25 Kg - .5 Kg/METRIC TON PRODUCT .5 LBS. - 1 LB/TON PRODUCT

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT FORMING
PLATE MILLS
PROCESS FLOW DIAGRAM

DWG 2-22-74
REV. 12-23-76

FIGURE III-5


COKE OVEN GAS, NATURAL GAS OR OIL FIRED FURNACE BURNERS 83340 Kg CAL/HR TO 1,250,100 Kg CAL./HR PER METRIC TON (300,000 - 4,500000 BTU/HR. PER INGOT TON)
CONTINUOUS CASTING MACHINE PRODUCT
SLAB MILL DIRECT TO SECONDARY FINISHING
SLABBING MILL SEE PROCESS FLOW DIAGRAM FIGURE III-2
SLAB STORAGE YARD
CONTINUOUS SLAB REHEAT FURNACES
SLABS HEATED TO ± 1232°C (± 2250°F) 146 Kg TO 732 Kg /Sq m HEARTH AREA (30 TO 150 LBS/FT.² HEARTH AREA)
± 272 METRIC TONS/HR. CAP. (± 300 TONS/HR. CAPACITY)
ROLL COOLING WATER (TYP)
HIGH PRESSURE DESCALING WATER (500-1500 PSI) (TYP)
SHEAR COOLING WATER
HIGH PRESS. DESCALING WATER (2000 PSI)
ROLL COOLING WATER
STRIP COOLING SPRAYS
FLYING SHEAR FOR CUTTING FLAT SHEETS TO LENGTHS (SHEAR MOVES W/STRIP)
TURN TABLE
TURN TABLE
TABLE ROLLS
RUN-OUT TABLE
STEEL SHEETS TO HOT PILER
SCALE BREAKER
BROADSIDE MILL
IF STRIP IS WIDER THAN AVAILABLE SLABS ARE REQUIRED
SLAB SHEAR
ROUGHING STANDS 4-HIGH
CROP SHEAR
STEEL SCRAP RECYCLED 44 Kg AVG/METRIC TON PROD. (88 LBS AVG/ TON PRODUCT)
SCALE BREAKER
FINISHING STANDS 4-HIGH
DOWN COILER
1 METRIC TON (1 INGOT TON) FINISHED PRODUCT
PROCESSED TO FLAT CUT SHEETS
TO COLD MILLS
RECYCLE COOLING WATER FOR FURNACE WATER COOLED SKIDS
8327 TO 12490 ℓ/METRIC TON PRODUCT (2,000 TO 3,000 GAL./ TON PRODUCT)
WATER, TRAMP OIL GREASES & MILL SCALE
(NO MILL SCALE @ FINISHING STANDS)
NOTE: MILL SCALE - 80 Kg AVG./METRIC TON PRODUCT (160 LBS. AVG./TON PRODUCT)
FeO - 55%, Fe3O4 - 41%, BALANCE 4% MISC. ELEMENTAL COMPOUND Fe2O3
WATER - 8% EVAPORATION RATE 27,040 ℓ/METRIC TON PRODUCT 6500 GAL/TON PRODUCT)
OIL - .15 Kg - .5 Kg/METRIC TON PRODUCT (0.3 LBS. TO 1 LB./TON PRODUCT)
HOT STRIP MILL PRODUCTION
(EFFICIENCY OF MILL BASED ON INPUT & OUTPUT AND NEGLECTING MILL DOWNTIME & EFFICIENCY)
a) SLABS TO HOT STRIP 85%-93% AVERAGE 89%
b) 1 METRIC TON FINISHED PRODUCT REQUIRES 1.236 METRIC TON INPUT (1 INGOT TON FINISHED PRODUCT REQUIRES 1.124 INGOT TON INPUT)
c) ± 8% RAW WASTE LOAD AS MILL SCALE/TON PRODUCT. ± 3% AS SCRAP
HOT STRIP MILL
ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT FORMING
HOT STRIP MILL
PROCESS FLOW DIAGRAM
DWG 2-22-74
REV 1 2-21-76
FIGURE III-6

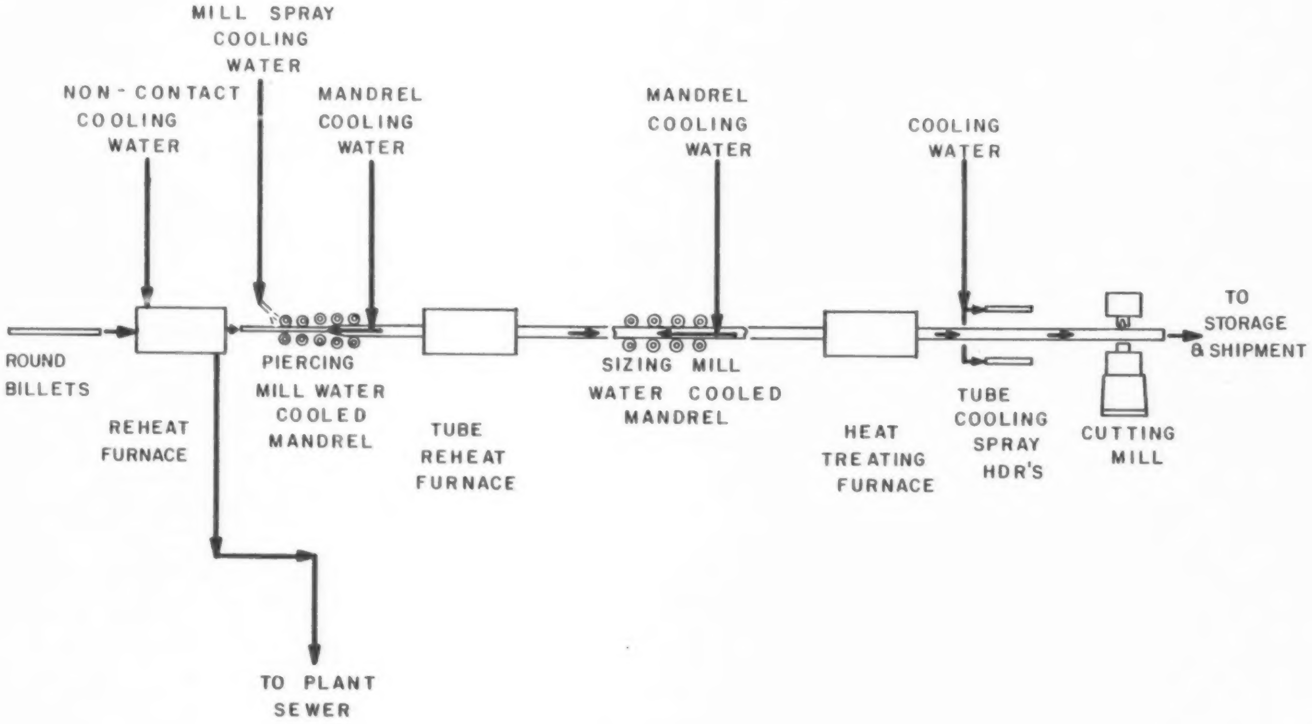

NON CONTACT
COOLING WATER
NON CONTACT
COOLING WATER
CRANE
BUNDLED SKELP
CUT TO LENGTH
RECUPERATORS
ROLL
LEVELER
HEATING
FURNACE
WATER
BOSH
TO STORAGE
COILED
NARROW
STRIP
UNCOILERS
FLASH
WELDER
COILED
SKELP
FORMING
&WELDING
MILL
HOT
SAW
COOLING
BED
COOLING
BED
DESCALER
& SIZING
MILL
WATER TO SCALE PIT
OR PLANT SEWERS
NON CONTACT
COOLING WATER
SCALE
PIT
TO PLANT
SEWERS

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
BUTT WELDED PIPE MILL
PROCESS FLOW DIAGRAM

Dwn. 3/13/79

FIGURE III-7


MILL SPRAY COOLING WATER
NON-CONTACT COOLING WATER
MANDREL COOLING WATER
MANDREL COOLING WATER
COOLING WATER
ROUND BILLETS
REHEAT FURNACE
PIERCING MILL WATER COOLED MANDREL
TUBE REHEAT FURNACE
SIZING MILL WATER COOLED MANDREL
HEAT TREATING FURNACE
TUBE COOLING SPRAY HDR'S
CUTTING MILL
TO STORAGE & SHIPMENT
TO PLANT SEWER

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
SEAMLESS TUBE MILL
PROCESS FLOW DIAGRAM

Dwn. 3/13/79

FIGURE III-8

HOT FORMING SUBCATEGORY

SECTION IV

SUBCATEGORIZATION

Introduction

The division of hot forming into the four subcategories under the originally promulgated limitations has been changed. Hot forming operations are now grouped into one subcategory. This subcategory is divided into four subdivisions that are the same as the original subcategories. These subdivisions have been segmented further in recognition of differences in flow among hot forming operations. A comparison of the 1976 segmentation with the revised subcategorization is shown below:

Segmentation (1976 Regulation)	Revised Segmentation
Hot Forming-Primary	Hot Forming-Primary
a. Carbon operations w/o scarfers	a. Carbon & Specialty operations w/o scarfers
b. Carbon operations w/scarfers	b. Carbon & Specialty operations w/scarfers
c. Specialty operations	
Hot Forming-Section	Hot Forming-Section
a. Carbon & Specialty operations	a. Carbon operations
	b. Specialty operations
Hot Forming-Flat	Hot Forming-Flat
a. Hot Strip & Sheet operations	a. Hot Strip & Sheet operations
b. Carbon Plate operations	b. Carbon Plate operations
c. Specialty Plate operations	c. Specialty Plate operations
Pipe & Tube (Hot Working)	Hot Forming - Pipe & Tube
a. Carbon & Specialty operations	a. Carbon & Specialty operations

Segments within the four subdivisions are based primarily upon differences in flow rates (applied, process, and discharge).

Although the Agency considered other factors, it found that flow rates and mill configuration are the most important factors in the

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segmentation of the four basic hot forming subdivisions. The Agency analyzed mill age and size to determine if these factors had a significant effect on either wastewater quality or quantity, or costs, but found no significant relationship. Also, such factors as product type, raw material, wastewater characteristics and treatability were considered. However, the analysis demonstrated that none of these factors are significant in terms of the segmentation developed. Each of these elements is discussed in greater detail below.

Factors Considered in Subcategorization

Manufacturing Process and Equipment

The manufacturing and production processes associated with the forming of steel products served as the principal basis for defining the hot forming subcategory. As explained in Section III, each hot forming operation is different. The process flow diagrams presented in Section III clearly illustrate these differences which result in different process water usage for the four types of hot forming operations. The Agency found the different flow rates, more than any other factor, to be the most significant in establishing the subdivisions contained herein. The flow rates associated with hot forming operations are discussed in greater detail later in this section.

Besides the range of production equipment used at the different types of hot forming operations, the Agency also analyzed the possible variations within each type of operation. For example, there are numerous section operations (i.e., tandem, cross-country). The Agency examined data for these different mill configurations to determine if variations in flow, wastewater characteristics, or other elements existed which would make further subdivision appropriate. However, the Agency determined that the basic subdivision outlined above is influenced by differences in equipment for primary mills only, some of which have machine scarfing equipment that generates additional wastewater. Hence, higher limitations and standards have been promulgated for those primary mills with machine scarfing equipment.

Final Products

Hot forming operations produce products of widely different size and shape. The revised subcategorization contains four groups which primarily reflect the different products being processed. However, within any one hot forming subdivision, the product type may affect the segmentation of that subdivision. For this reason, the data for each type of hot forming operation were analyzed for variations due to final product considerations. The Agency found that only the flat subdivision required further segmentation because of the type of product processed. There are no product differences that significantly affect the ability to achieve the effluent limitations or standards in the other hot forming subdivisions. Additional discussion of this factor is presented below.

Primary Mills

In primary operations, two basic final products are processed from the hot steel ingots: slabs and blooms. Most mills (58%) produce either blooms or slabs; however, approximately 35% of the primary mills produce both blooms and slabs. The remaining primary mills (7%) produce products other than slabs or blooms, such as bars or heavy plate.

The data for all primary mills indicate that no significant differences exist among the product types. Water use rates are similar and the Agency found no difference in the technical feasibility of achieving the limitations and standards. For these reasons, the Agency concluded that further subdivision of primary operations based upon product type is not appropriate.

Section Mills

In section hot forming operations, a wide variety of products are produced, ranging from angles to railroad wheels to billets. The responses to the DCPs show that more than 40 different products are produced in the section mills in the United States. At about 30% of the mills, a single product is produced. However, at the remaining mills, more than one product is processed, with some mills producing up to ten products. This diversity complicated the Agency's analysis of the effect of final products on subcategorization. However, flow data for mills producing different products indicate there are no discret flow rates applicable to different products. Thus, the Agency did not subdivide section mills into segments by product type.

To determine if flow variations exist between the different products, the flow data for the mills were separated into eight product classifications. For example, all types of beam mills were put into the beam category and all the different types of bar mills were classified as bar mills. This grouping of similar product types consolidated the data base and simplified the flow analysis. The Agency then conducted statistical analyses on these groupings to compare the applied and discharge flow rates on a gallon/ton basis. The Agency concluded that the data for all mills are within the same statistical population. The Agency did not find any significant variations which would indicate that any one type of section mill requires more (or less) water or that wastewaters from any one type could not be treated and recycled to the degree necessary to achieve the limitations. For these reasons, the Agency concluded that further segmentation of the section mill subdivision based upon final product considerations is not appropriate.

Flat Mills

The three types of flat mills operating in the United States today are hot strip and sheet mills (HSM), plate mills, and combination mills which produce both plate and hot strip. Of the 80 flat mills, 29 are hot strip mills, 25 are plate mills, and the remaining 26 are combination mills. For this analysis, strip mills, sheet mills, and skelp mills were grouped together under the strip mill designation because of similarities in mill configurations and flow rates.

As with other hot forming operations, different types of flat mills produce effluents of similar volume and quality. More information on wastewater characteristics is provided later in this section.

When the Agency analyzed flow rates for flat operations, it found significant variations which affect the segmentation of the flat subdivision. Hot strip and sheet mills and combination mills were compared, but it was found that both types of mills have similar applied flows and wastewaters from these mills can be reduced to similar levels. Therefore, combinations mills were combined with hot strip and sheet mills for the purpose of developing effluent limitations and standards. However, the Agency found significant differences between plate and hot strip mills, with hot strip mills using up to 4900 gallons/ton more applied flow than some plate mills. This wide variation led the Agency to further segment the flat subdivision into plate and hot strip mills.

Pipe and Tube Mills

As noted above, the two hot working pipe and tube products are butt welded pipe and seamless tube. The Agency compared data for these two types of pipe and tube mills and found no significant differences in the final product which would affect segmentation. Wastewater quality and quantities are similar for both types of mills and the Agency found the limitations and standards are being achieved at each. Hence, no segmentation of the pipe and tube subdivision is appropriate.

Raw Materials

Raw materials for hot forming operations include steels of various material specifications. A basic split was made between carbon steel and specialty steel mills. For purposes of this report any mill rolling less than 50% carbon steel is called a "specialty steel" operation. Of the 485 hot forming operations for which DCP responses were received, 96 (19.8%) are specialty steel operations. While the sampling data do not show a significant difference in treated wastewater quality between carbon and specialty operations, the Agency found significant differences in flow rates in some hot forming subdivisions. The differences between the carbon and specialty mills in each hot forming subdivision are examined below.

Primary Mills

Data for primary mills show that raw materials affect only model plant size. There are no significant differences in the wastewater characteristics between the two types of mills. In addition, the Agency found no significant differences in flow between carbon and specialty operations. The average applied flow for carbon mills without scarfers is 2250 gallons/ton, and for specialty mills without scarfers, 2625 gallons/ton. A model applied flow of 2300 gallons/ton was selected for primary operations. The achievability of this model flow is demonstrated by both carbon and specialty operations.

The average production capacity of carbon operations is about 6620 tons/day while that of the specialty operations is about 1440 tons/day. Because of this difference, the Agency prepared separate cost estimates for the carbon and specialty treatment models.

Section Mills

The Agency analyzed carbon and specialty section mills in the same fashion as the primary operations. It found differences in flow rates (5100 gal/ton vs 3200 gal/ton) and average sizes (3050 tons/day vs 1200 tons/day) between carbon and specialty operations which led to further segmentation and separate costing. It did not find any significant differences in wastewater characteristics of the section mills using different raw materials.

Flat Mills

For flat operations, the raw material analysis led to the determination that separate limitations are appropriate for carbon and specialty plate operations due to differences in flow rates (applied and discharge). The Agency found no difference between the carbon and specialty hot strip operations. Also, as for primary and section operations, separate costing was completed for carbon and specialty plate operations.

Carbon plate mills use 1900 gallons/ton more applied flow than the specialty mills (3400 gal/ton vs 1500 gal/ton). For this reason, the Agency has promulgated separate limitations and standards for the two types of plate mills.

Flow rates for carbon and specialty hot strip and sheet mills are not significantly different (6380 gal/ton vs 6710 gal/ton). The Agency selected an applied flow basis of 6400 gallons/ton for developing the limitations and standards for the hot strip and sheet mills. This flow rate is well demonstrated at both carbon and specialty operations.

As with the primary and section operations, a difference in the sizes of specialty and carbon plate mills required separate cost development. For the plate mills, the average size of carbon mills is 3480 tons/day and for specialty mills, 1060 tons/day. For hot strip mills, there is no significant difference in size between carbon and specialty operations. In fact, both carbon and specialty products are often rolled on the same mill. For these reasons, all hot strip operations were costed together.

Pipe & Tube Mills

The only significant difference between carbon and specialty pipe and tube operations is in size. Wastewater quality and quantity are similar. Carbon operations have an average applied flow of 5490 gallons/ton and the specialty operations have an average applied flow of 5790 gallons/ton. A flow basis of 5520 gallons/ton was used to develop the limitations and standards for the carbon and specialty operations. This flow is demonstrated at both types of mills.

Production rates are more than twice as great for carbon mills as for specialty mills (970 tons/day versus 480 tons/day). This significant difference in size led to separate costing of the treatment systems.

Wastewater Characteristics and Treatability

The wastewater characteristics of the hot forming operations depend upon scale formation and oil usage within the mill. Although there are differences in pollutant concentrations generated by different hot forming operations, the Agency concluded that it is not appropriate to subdivide the hot forming subdivisions on this basis as described below.

Suspended solids and oil and grease are the conventional pollutants found in hot forming operation wastewaters. Toxic metal pollutants are also present in lesser concentrations due to the use of alloying elements in the steel and contamination from other sources. From scale generation rates, the Agency estimates that raw wastewater concentrations of suspended solids vary from 390 mg/l for specialty plate operations to 7,590 mg/l for carbon primary operations with scarfers. Also, based upon oil usage rates data, the Agency has estimated that the oil concentrations in hot forming operation wastewaters range from 15 to 160 mg/l. The Agency estimated the raw waste concentrations for suspended solids and oils because consistent and reliable samples of raw wastewaters are difficult to obtain from most hot forming operations because of the danger involved in obtaining such samples. At most mills, the Agency sampled the primary scale pit effluent and based its scale pit effluent estimates on those data.

As noted above, there is a significant variation in raw wastewater concentrations from hot forming operations. However, these differences are reduced to a fairly narrow range after primary scale pit treatment as shown below:

	Concentration Range of Pollutants(mg/l)	
	Raw Wastewaters	Discharge from Primary Scale Pits
Total Susp. Solids	390-7,590	48-91
Oil & Grease	15-160	15-42

Accordingly, the Agency concluded that it is not necessary to differentiate between the types of hot forming operations because of wastewater characteristics.

Possible variations in wastewater quality between carbon and specialty operations were also analyzed. However, no significant variations were found. While discharges from some of the specialty mills had higher levels of toxic metal pollutants than carbon mills, some carbon mills also had comparably high levels. In any event, toxic metals from both carbon and specialty mills can be reduced to similar levels with the same type of treatment. On this basis, the Agency concluded that no further subcategorization is warranted.

Similar treatment components are used at all mills and a consistent range of effluent quality is demonstrated. Wastewaters from most mills in each of the hot forming subdivisions are treated in central treatment systems (combining different hot forming wastewaters prior to treatment). Typical treatment components include sedimentation, clarification, or filtration systems, often in combination. Extensive recycle systems are also installed at many plant sites. Flocculation with polymers or other flocculant aid is often used in conjunction with sedimentation. Because of the similarities in treatability of hot forming wastewaters, no further subdivision based upon this factor is appropriate.

Size and Age

The Agency also analyzed possible correlations relating the effects of age and size upon wastewater flow, wastewater characteristics and the ability to retrofit treatment equipment to existing facilities. However, it found no relationships which warranted further division.

As discussed earlier in this section, size has an impact on costing of the treatment models for specialty and carbon hot forming operations. This is the only apparent impact that size has on the hot forming subdivisions. Hot forming operations vary greatly in physical size, layout, and product size. However, an analysis of those factors revealed no significant relationships between process water usage, discharge flow rates, effluent quality, or any other pertinent factor. Figures IV-1 through IV-8 show there are no relationships between discharge flow (gal/ton) and size (tons/day). Since mills are generally operated in a similar manner, the resulting wastewater characteristics are similar regardless of size. The sampling data do not show any significant difference in wastewater characteristics among different sized mills.

The Agency also found that the size of a particular hot forming operation does not affect the ability to install adequate treatment systems. Large and small mills have treatment systems that are approximately the same age and which have similar treatment components. Also, the cost data supplied by the industry show that the costs to install treatment (on a $/ton basis) are more significantly affected by the type of treatment installed than by the size or age of the mill. It was found that the costs on a $/ton basis vary slightly based on the size of the mill. However, the Agency accounted for these variations by developing costs for average sized model mills within each subdivision and by developing costs separately for carbon and specialty plants, where warranted.

The relationship between wastewater flow and age was analyzed in the same fashion. The plots of discharge flow (gallons/ton) versus age (first year of operation) are shown in Figures IV-1 through IV-8. As with the flow versus size plots, no relationship between flow and age is evident. Therefore, the Agency has concluded that the age of a mill has no significant effect on discharge flow.

The Agency also analyzed the effect of age on the ability, ease, and cost of installing or retrofitting pollution control equipment. Table IV-1 lists older hot forming operations that have been retrofitted with pollution control equipment. The numerous examples demonstrate that pollution control equipment has been retrofitted at many older mills.

The Agency also demonstrated that treatment systems could be retrofitted on older mills at about the same costs as for newer mills. The responses to the D-DCPs and past cost studies were used in this demonstration. Almost all D-DCP responses indicate no retrofit costs were associated with the installation of treatment systems, or, that retrofit costs could not be distinguished from treatment costs. Retrofit costs, typically less than 5% of the total installation cost were reported for some mills. Retrofit costs were also analyzed by comparing detailed cost estimates completed for retrofitted plants (with no consideration for age) with the actual cost of installation for these systems. This analysis also showed that no significant additional costs are associated with the installation of treatment facilities onto "older" plants. Hence, the Agency concluded that about the same costs for pollution control are necessary for "older" and "newer" plants.

The sampling data collected during this study were analyzed to determine if age has a significant effect on wastewater characteristics or effluent quality. The ages (first year of production) of the operations sampled varied from 1904 to 1974. No significant differences were noted in effluent quality from older mills versus newer mills. In fact, the mill that was built in 1904 has one of the newer and more sophisticated treatment systems. In any event, comparable levels of discharge are achieved at mills of all ages where adequate treatment is installed.

Based upon the above, the Agency finds that both old and newer production facilities generate similar raw wastewater pollutant loadings; that pollution control facilities can be and have been retrofitted to both old and newer production facilities without substantial retrofit costs; that these pollution control facilities can and are achieving the same effluent quality; and, that further subcategorization or further segmentation within this subcategory on the basis of age or size is not appropriate.

Geographic Location

The Agency examined the raw waste characteristics, process water application rates, discharge rates, effluent quality and other factors pertaining to plant location and found no general relationship or pattern. Hot forming operations are located in 22 states across the country. Most of these operations are located in the major steel producing areas of Indiana, Illinois, Pennsylvania and Ohio. Table IV-2 summarizes the location of hot forming operations for which DCPs were received.

About 12% of the mills are located in what could be considered "arid" or "semi-arid" regions. The Agency analyzed water consumption for hot forming operations and determined the amount to be small. For this reason, subdivision is not necessary because of water consumption or geographic location considerations. Additional details on this issue are presented in Section VIII.

Process Water Usage

As discussed earlier, the Agency found significant variations in both the applied and discharge flows of the various hot forming subdivisions. This factor, in combination with those described previously, led the Agency to revise the segmentation of the hot forming subcategory from that contained in the 1976 regulation.

To analyze the flow data, applied flow rates were developed for each subdivision and each potential segment of that subdivision. Production weighted average flows were used for this analysis. These flow value derivations are shown in Section IX for each hot forming subdivision. Statistical analyses were completed on these applied flows to verify previous segmentation and to develop new segments where necessary.

After applied flow rates were developed, the Agency determined recycle rates for each category. These recycle rates were used with the applied flow to calculate the appropriate discharge flows used to develop the BPT, BCT and NSPS, limitations and standards. A summary of the hot forming model applied flows, recycle rates and resultant discharge flows is shown below:

	Applied Flow (gal/ton)	Recycle Rates (%)		Discharge (gal/ton)	
		BPT/BCT	NSPS	BPT/BCT	NSPS
PRIMARY					
a. Carbon & Spec. wo/scarf.	2300	61	96	897	90
b. Carbon & Spec. w/scarf.	3400	61	96	1326	140
SECTION					
a. Carbon	5100	58	96	2142	200
b. Specialty	3200	58	96	1344	130
FLAT					
a. Hot Strip	6400	60	96	2560	260
b. Carb.Plate	3400	60	96	1360	140
c. Spec.Plate	1500	60	96	600	60
PIPE & TUBE					
a. Carbon & Spec.	5520	77	96	1270	220

Additional details on these flow rates and recycle rates are presented in Sections IX, X, and XII.

TABLE IV-1

EXAMPLES OF PLANTS WITH RETROFITTED POLLUTION CONTROL EQUIPMENT HOT FORMING SUBCATEGORY

Subdivision	Plant Reference Code	Plant Age (year)	Treatment Age (year)
A. Primary	0020B	1948	1971
	0060D	1910	1959
	0060I	1941	1958
	0088D	1959	1971
	0112	1907	1979
	0112A	1930	1970
	0112B	1928	1970
	0176	1917	1965
	0188A	1959	1970
	0188B	1940	1946
	0248C	1962	1975
	0320	1936	1952
B. Section	0060C	1913	1920-1975
	0060F	1942	1965
	0060I	1956	1958
	0060K	1920	1955
	0088D	1962	1971
	0112	1907	1943-1979
	0112A	1937	1971-1978
	0112F	1922	1947-1978
	0136B	1908	1959-1969
	0316	1959	1966
C. Flat			
1 - Plate	0112C	1902	1964
	0424	1970	1971-1978
	0448A	1943	1948
	0496	1918	1948-1977
	0860B	1936	1967

TABLE IV-1
EXAMPLES OF PLANTS WITH RETROFITTED
POLLUTION CONTROL EQUIPMENT
HOT FORMING SUBCATEGORY
PAGE 2

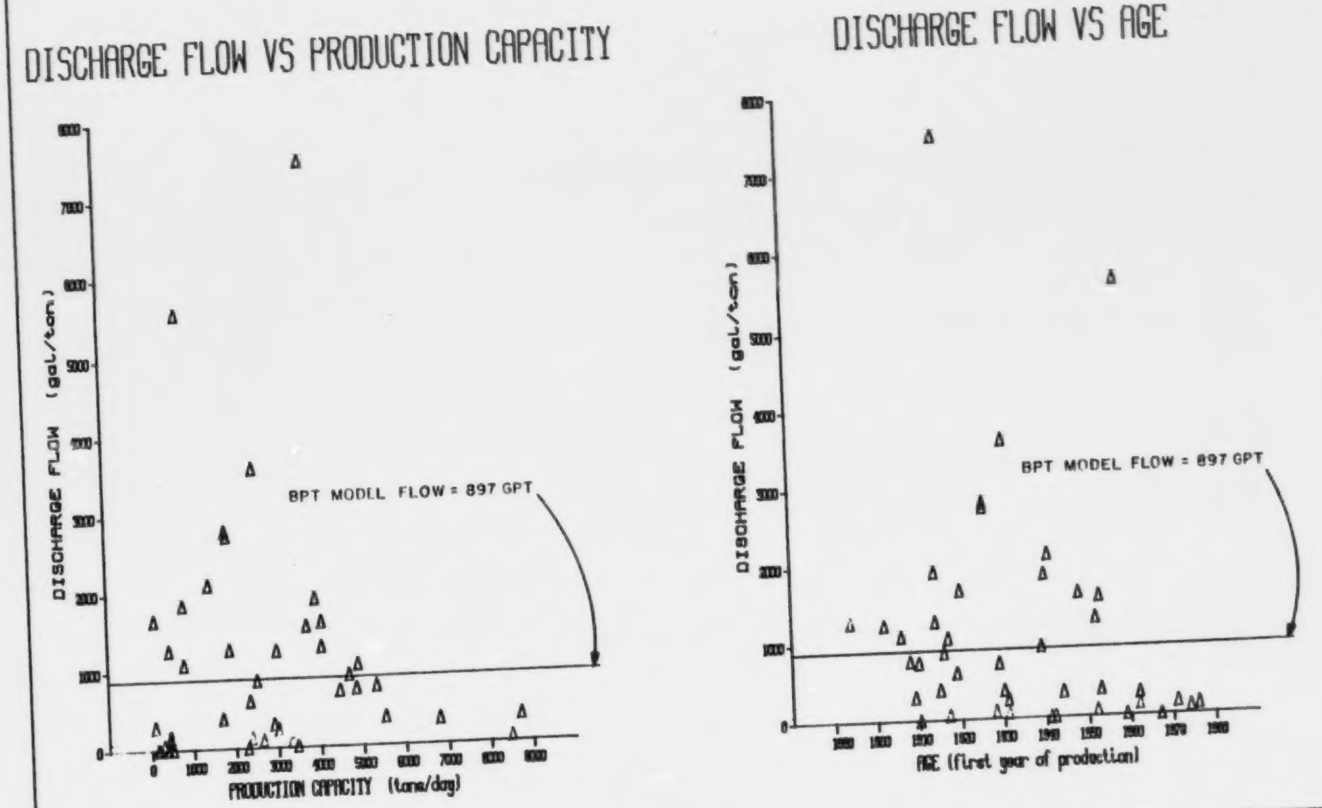
Subdivision	Plant Reference Code	Plant Age (year)	Treatment Age (year)
2 - Hot Strip & Sheet	0020B	1953	1971
	0396D	1960	1970
	0432A	1957	1974
	0476A	1915	1977
	0684F	1937	1969
	0856D	1938	1980
	0856P	1929	1966
D. Pipe & Tube	0060C	1913	1948
	0060F	1950	1971
	0060R	1930	1961
	0432A	1957	1974
	0476A	1930	1977
	0548A	1945	1969
	0728	1929	1952
	0856N	1930	1961
	0856Q	1930	1963
	0916A	1931	1971
	0920C	1934	1970
	0948A	1926	1966

TABLE IV-2

GEOGRAPHIC LOCATION OF HOT FORMING OPERATIONS

State	Primary Mills	Section Mills	Flat Mills	Pipe & Tube Mills	Total	% of Total
Pennsylvania	32	79	27	20	158	32.6
Ohio	17	29	15	14	75	15.5
Illinois	11	30	6	11	58	12.0
Indiana	13	19	10	11	53	10.9
Texas	4	6	4	6	20	4.1
California	5	9	2	1	19	3.9
Alabama	3	9	5	0	17	3.5
New York	4	10	1	0	15	3.1
Maryland	4	5	3	2	14	2.9
Colorado	1	11	0	1	12	2.5
Michigan	4	3	2	0	9	2.0
West Virginia	2	3	1	0	6	1.2
Georgia	0	6	0	0	6	1.2
Kentucky	3	0	1	1	5	1.0
Utah	2	1	1	0	4	0.8
Missouri	0	0	4	0	4	0.8
Washington	1	2	0	0	3	0.6
Florida	0	3	0	0	3	0.6
Oklahoma	0	1	0	0	1	0.2
N. Carolina	0	1	0	0	1	0.2
S. Carolina	0	1	0	0	1	0.2
Connecticut	0	1	0	0	1	0.2
# of States = 22					485	100

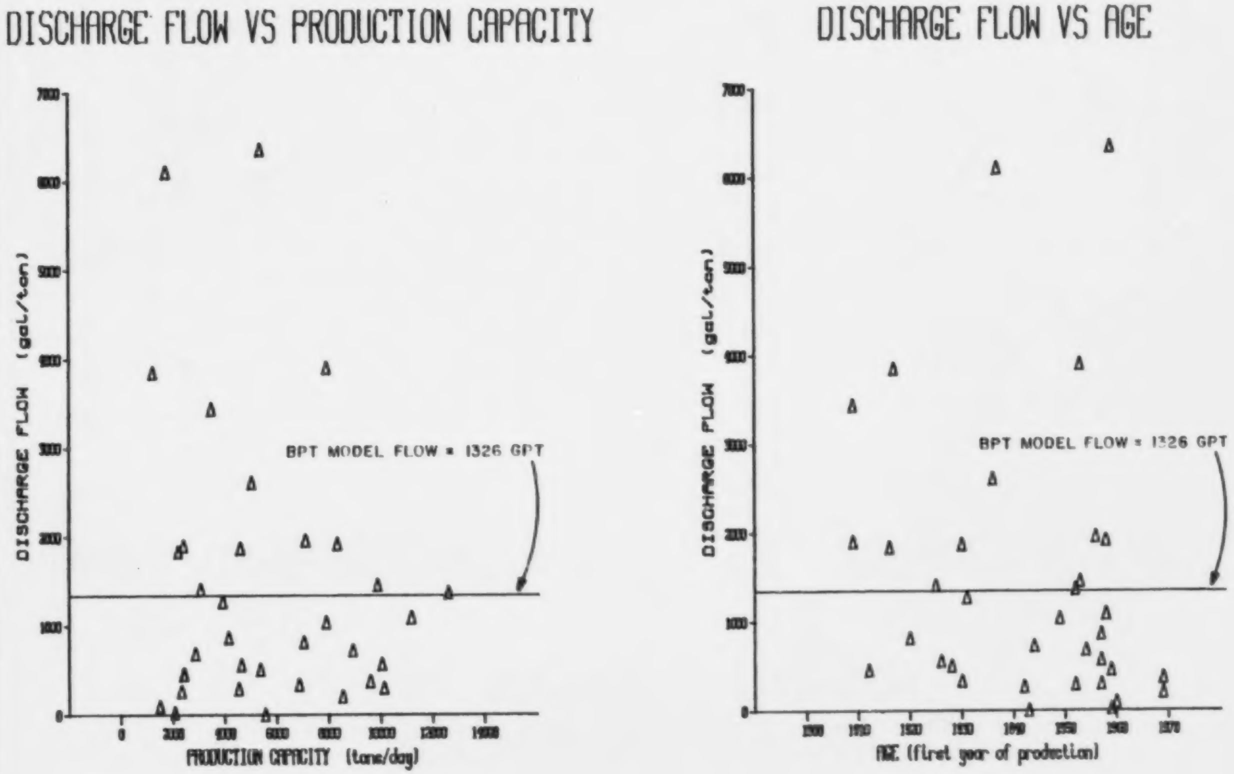
FIGURE IV-1
HOT FORMING SUBCATEGORY
PRIMARY - WITHOUT SCARFERS



DISCHARGE FLOW VS PRODUCTION CAPACITY

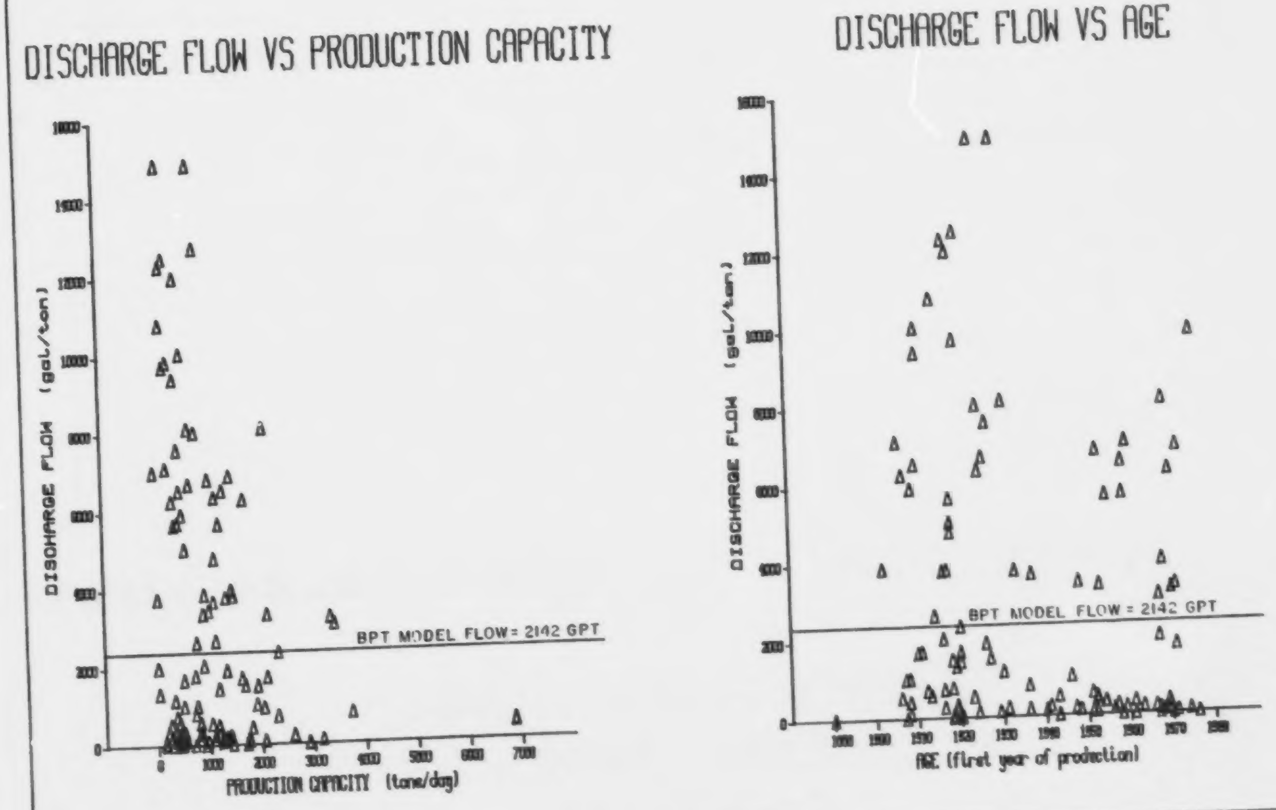
DISCHARGE FLOW VS AGE

FIGURE IV–2
HOT FORMING SUBCATEGORY
PRIMARY – WITH SCARFERS


DISCHARGE FLOW VS PRODUCTION CAPACITY

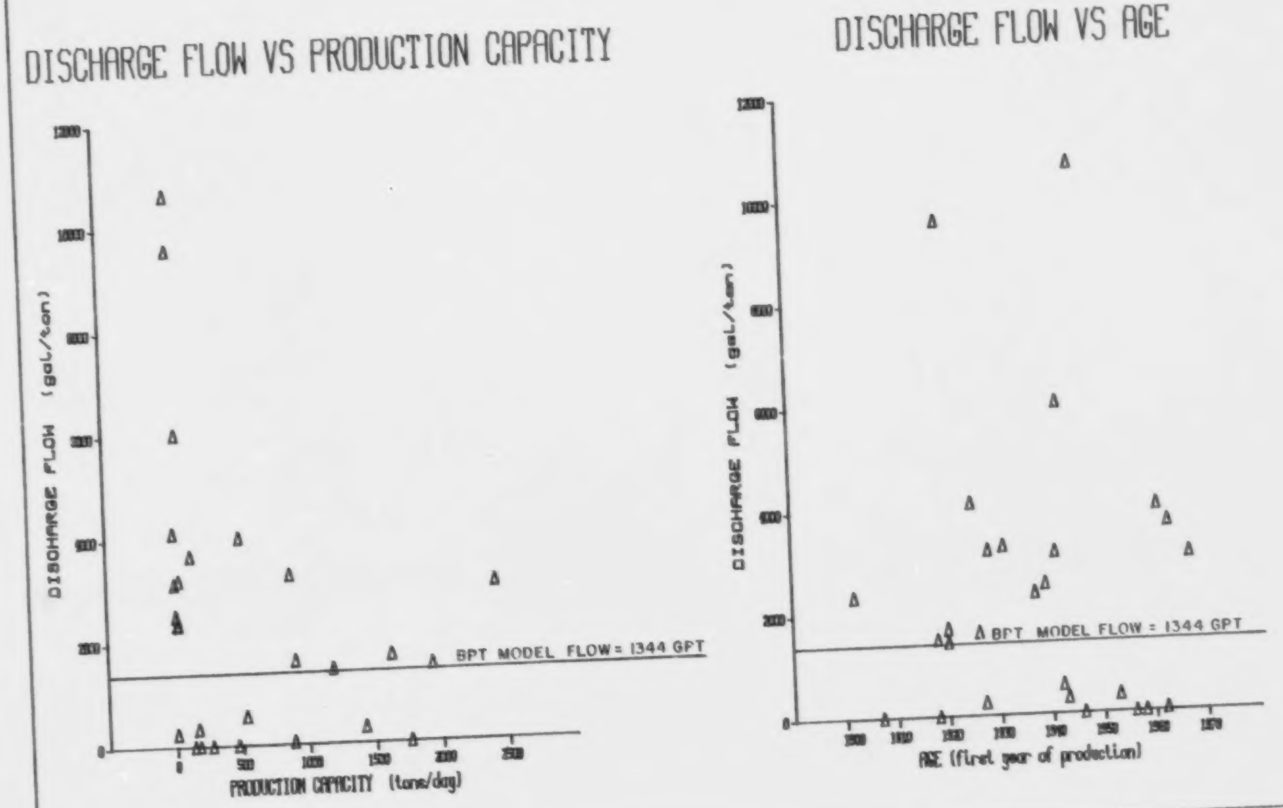
DISCHARGE FLOW VS AGE

FIGURE IV–3
HOT FORMING SUBCATEGORY
SECTION – CARBON


DISCHARGE FLOW VS PRODUCTION CAPACITY

DISCHARGE FLOW VS AGE

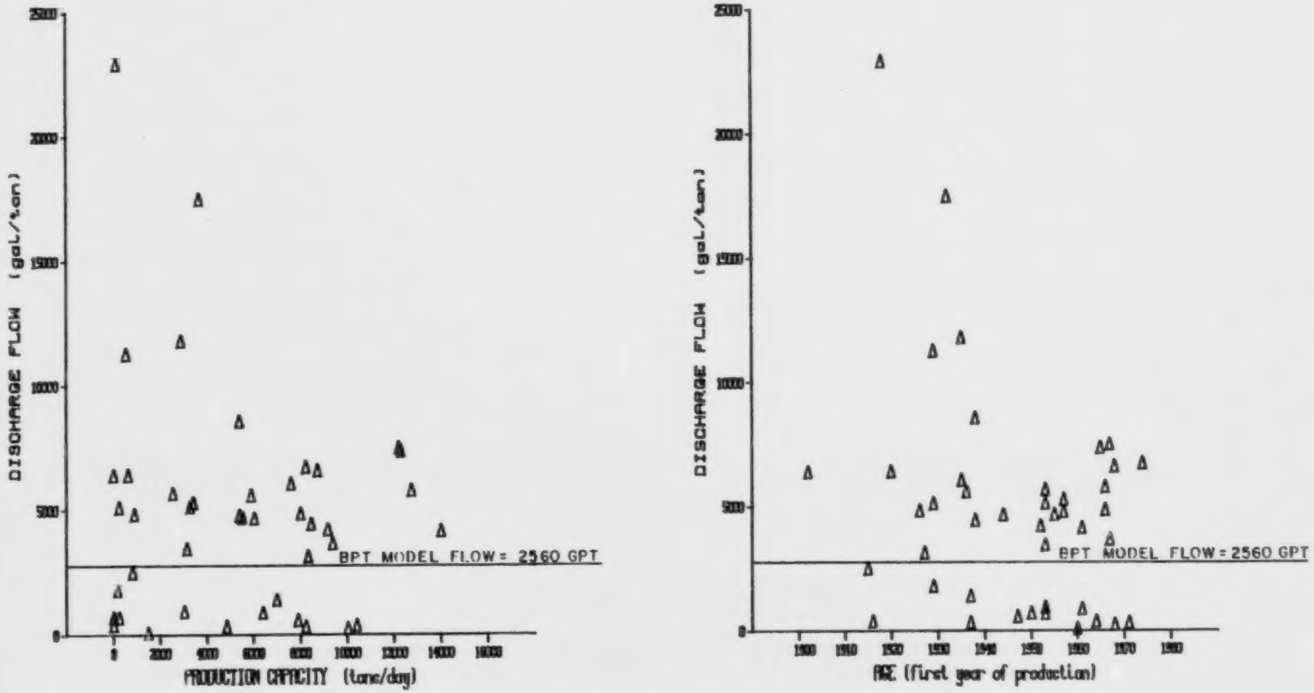
FIGURE IV-4
HOT FORMING SUBCATEGORY
SECTION - SPECIALTY



DISCHARGE FLOW VS PRODUCTION CAPACITY

DISCHARGE FLOW VS AGE

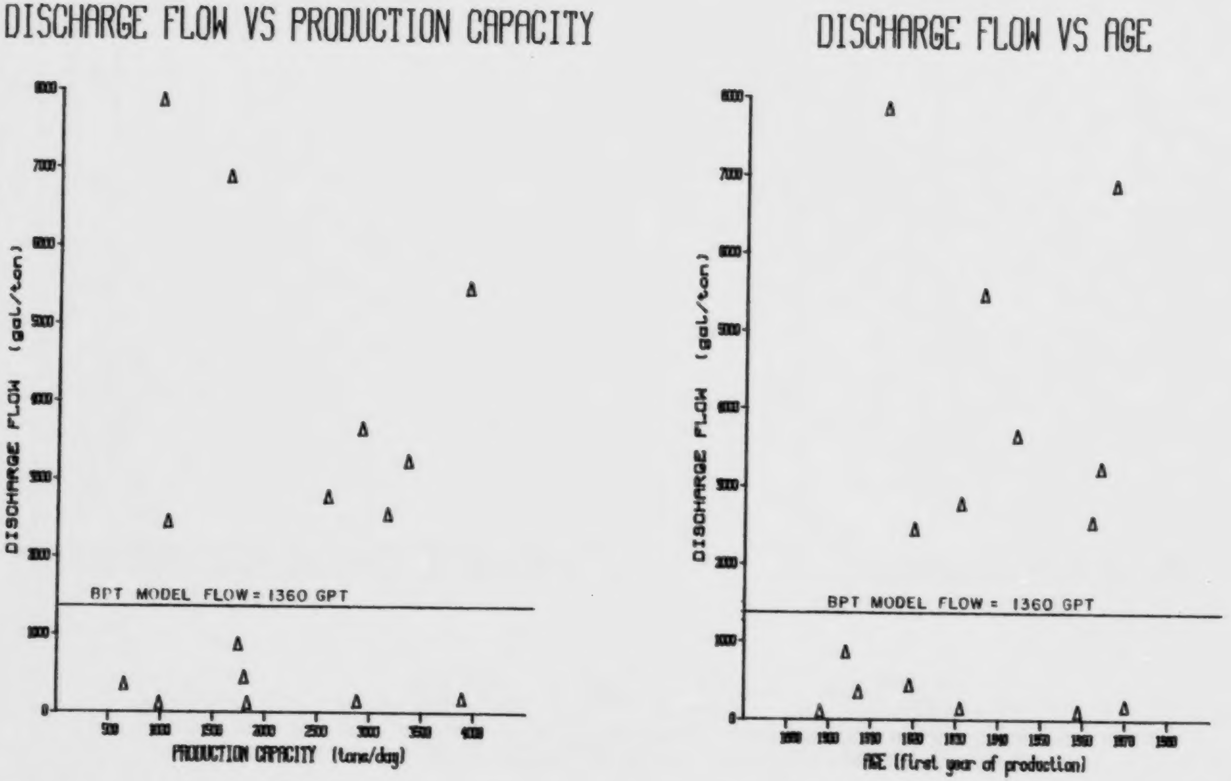
FIGURE IV–5
HOT FORMING SUBCATEGORY
FLAT – HOT STRIP & SHEET



DISCHARGE FLOW VS PRODUCTION CAPACITY

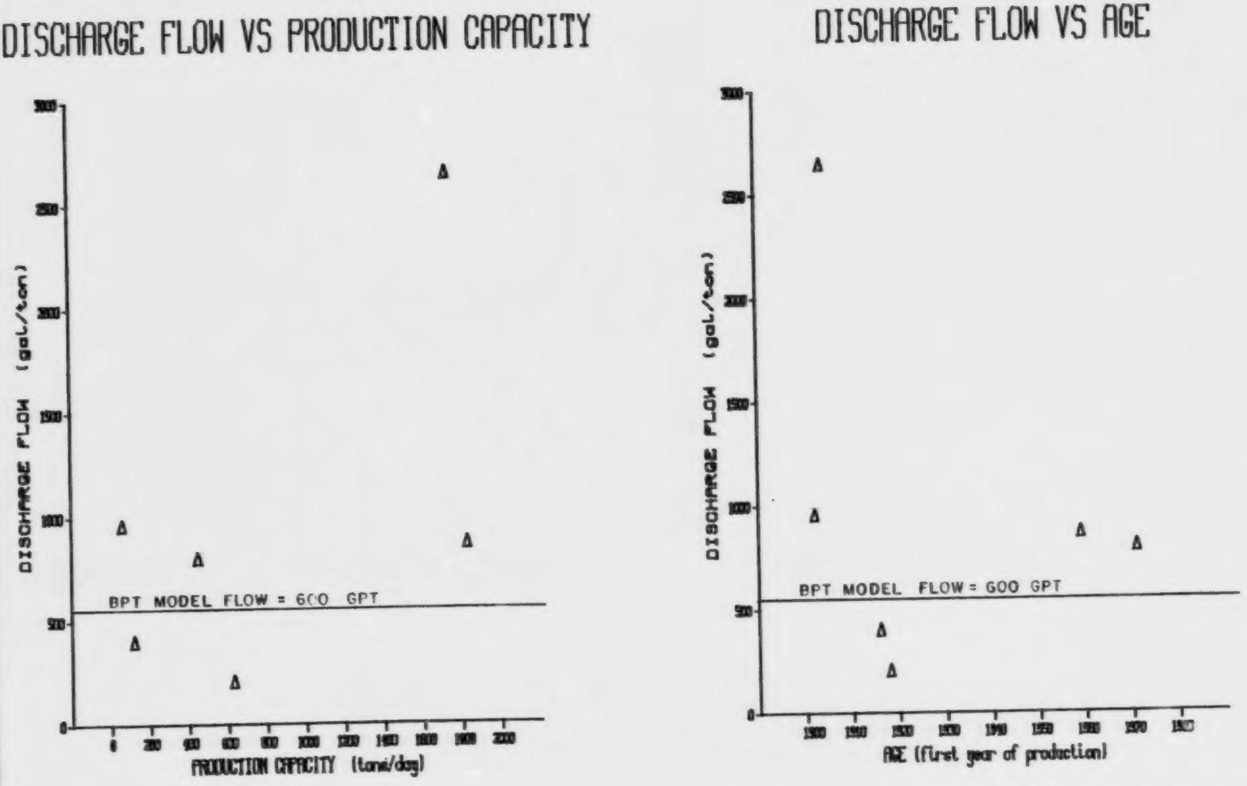
DISCHARGE FLOW VS AGE

FIGURE IV–6
HOT FORMING SUBCATEGORY
FLAT – PLATE – CARBON


DISCHARGE FLOW VS PRODUCTION CAPACITY

DISCHARGE FLOW VS AGE

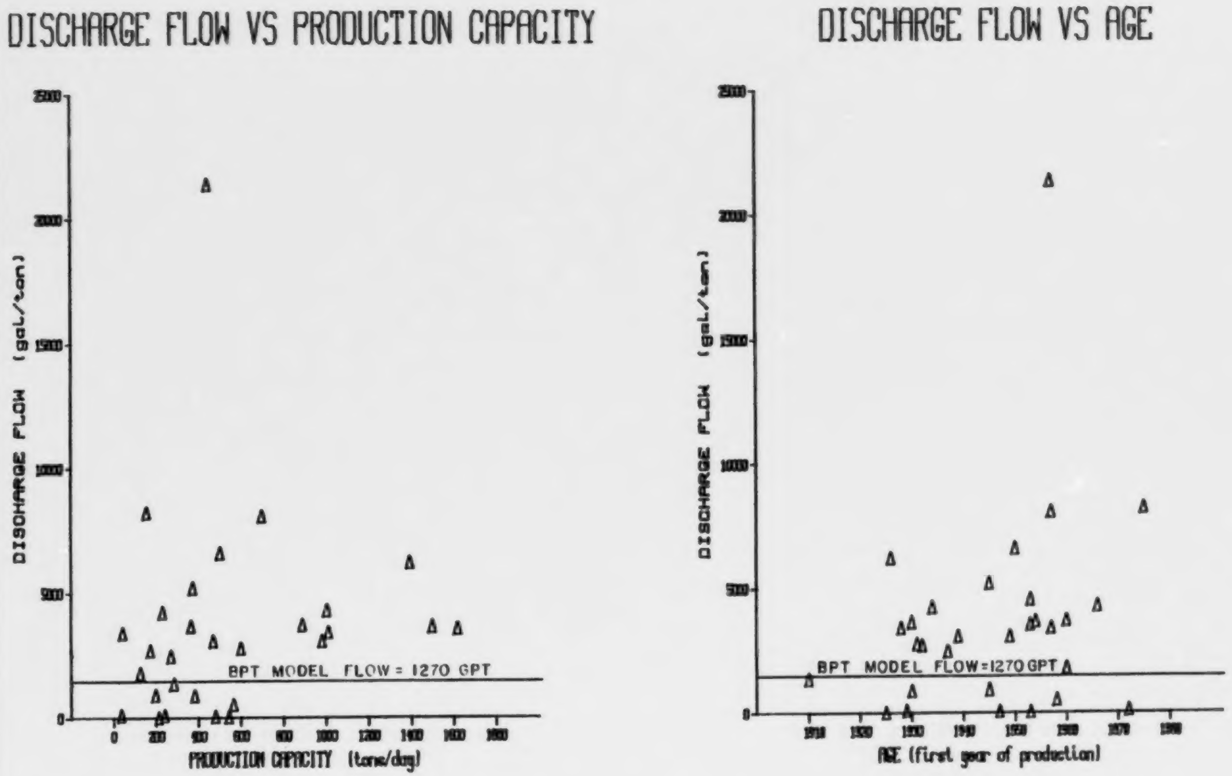
FIGURE IV–7
HOT FORMING SUBCATEGORY
FLAT – PLATE – SPECIALTY



DISCHARGE FLOW VS PRODUCTION CAPACITY

DISCHARGE FLOW VS AGE

FIGURE IV–8
HOT FORMING SUBCATEGORY
PIPE & TUBE



DISCHARGE FLOW VS PRODUCTION CAPACITY

DISCHARGE FLOW VS AGE

HOT FORMING SUBCATEGORY

SECTION V

WATER USE AND WASTEWATER CHARACTERIZATION

Introduction

This section describes the water systems in use in the hot forming subcategory and the types of wastewaters originating from each of the rolling mill processes. The description of the water systems is limited to those water systems which come into contact with pollutants generated by the processes, and excludes noncontact cooling water systems. Wastewater characterization for hot forming mills is based upon monitoring data obtained during field sampling surveys, and data supplied directly by the industry.

General Discussion

Water Use

Hot forming wastewaters are comprised of direct contact cooling and descaling waters. Roll cooling water is used to cool the work rolls of the mill stands to prevent surface cracking of the steel rolls due to sudden temperature changes. When not rolling the hot steel, the rolls are kept turning to prevent uneven cooling within the steel rolls. Approximately 4% of the water sprayed on the hot steel evaporates and the balance is discharged beneath the rolling mill to trenches called flumes.

When the hot steel product is being rolled, iron oxide scale (called mill scale) forms on the surface of the hot steel. The scale is removed by direct contact high pressure (1,000-2,000 psig) sprays which release water before each roll pass of the product. Low pressure spray cooling water is also used to keep the mill stand rolls and the table rolls cool as the hot steel passes over or in between them.

Wastewaters from descaling, roll cooling, hot shear equipment cooling, roll tables, and flume flushing, are generally discharged through flumes or trenches to inground concrete settling chambers called scale pits where the heavier solid particles settle out. Scale pits often contain underflow weirs with launders to trap oils and greases picked up by the process waters. The waste oils are removed from the water surfaces by belts, ropes, or other types of floating oil skimmers, and then discharged to waste oil storage tanks. Contract haulers periodically remove the accumulated oils. The scale is cleaned by clam shell buckets or scale pit drag link conveyors. Waste oils are generated at an average rate of 0.1 to 0.2 gallons per ton of steel produced at the various rolling mill operations (i.e., primary, section). Major sources of oils at many mills are the oil cellars

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where recirculated oils are conditioned (i.e. separated from entrained water). The discharge from the cellars often contains high quantities of oil and is usually directed to the scale pits. Other major sources of oil include leaks from lubricating and hydraulic systems. The primary scale pit overflows are generally not directly discharged, but are usually routed to wastewater treatment plants for additional treatment. Many rolling mills recycle part of the scale pit effluent back to the rolling mill for use in flume flushing.

Wastewater Characterization

Scale and oil and grease are the conventional pollutants discharged from rolling mill operations. As the hot steel is being rolled in the mill stands, the steel surface oxidizes and is continuously scaling and flaking off. The scale particles range in size from submicron to several millimeters. The particles are 70-75% iron and consist of ferrous oxide (FeO), and ferric oxide (Fe_2O_3). Overhead cranes equipped with clam buckets are generally used to clean the scale pits. Scale pit effluents are discharged to plant sewers or are partially recycled back to the mills. The suspended solids content in scale pit overflows can be as high as 300 mg/l. These wastewaters can be further treated by clarification, filtration, and recycle. Oils from the scale pit effluents are generally in the range of 15 to 45 mg/l. Oils are found in rolling mill wastewaters as a result of oil conditioning, oil spills, line ruptures, and excessive dripping of lubricants. Also, appreciable quantities of spent oils and greases are contributed to the wastewaters when equipment is washed down. Wastewater concentrations as high as 150 mg/l may be reached during line ruptures.

The discharges from the different types of hot forming operations are similar with respect to suspended solids, oil and grease, and pH. However, the quantity of suspended solids generated and applied water rates vary among rolling mills.

Toxic metal pollutants are found in the wastewaters from the rolling mills. The appearance of toxic metals such as chromium, copper, lead, nickel, and zinc result from the use of these metals in steelmaking and alloying and possibly in lubricants used at certain mills. Relatively few toxic organic pollutants were detected in wastewaters from the hot forming mills sampled. This subject is discussed in Section VI.

Water Use

1. Primary Rolling Mills

Blooming or slabbing rolling mills generally have six principal contact water systems.

a. High pressure descaling spray water
b. Work roll and roll table spray cooling water
c. Hot shear spray cooling water
d. Flume flushing
e. Hot scarfer spray flushing and cooling system
f. Hot scarfer wet gas cleaning system

The first four sources are common to all hot forming operations and were briefly discussed above. Hot scarfer water systems and hot scarfer gas scrubber systems are described below.

Automatic Hot Scarfers

Automatic hot scarfing machines for surface finishing generate fumes, smoke, and slag. The scarfing operation continuously produces molten slag just ahead of the reaction zone. This slag is directed to a slag pit or trench beneath the scarfer machine where high pressure water (150 psig) is used to break up and flush the slag. Exposed equipment in the vicinity of the scarfing reaction is also sprayed to protect it from heat and flying slag particles.

Wastewaters from the automatic scarfer spray water systems are generally routed to a scale pit where the heavy slag particles settle out. The scale pit overflow is discharged to plant sewers. Often these spray waters are discharged into the same primary scale pit as the mill equipment cooling and descaling waters.

The high pressure spray water granulates the slag and protects the scarfer pinch rolls from slag splatter. The slag produced weighs approximately 180 lbs/ft^3 dry and 198 lbs/ft^3 wet. The slag particles vary in size from smaller than 100 mesh to less than 1/2 inch in size with most (75%) in the 40 to 60 mesh range. The chemical composition of slag is approximately:

Metallic Iron (Fe)	44%
Ferrous Oxide (FeO)	33%
Ferric Oxide (Fe_2O_3)	21%
Balance (SiO_2, Mn, C, etc.)	2%
	100%

The total iron content in scarfer slag is about 84%.

The quantity of slag produced by the scarfing process ranges from 2% to 4% of the tonnage scarfed whereas the quantity of mill scale produced by the primary mills ranges from 1-1/2 to 3% of the tonnage rolled by the mill.

As noted earlier, the hot scarfing process results in appreciable quantities of fume and smoke. Additional wastewater results when wet air cleaning systems are used to clean the exhaust gases from the scarfer. Dry collectors are not normally used because the exhaust gases are saturated with water vapor. Discharge waters may be acidic if resulphurized steels are being scarfed. The discharge rate varies with the type of gas cleaning system used. The high energy Venturi requires 1500-2000 gpm, while wet continuous precipitators use about 200 gpm, and intermittent spray wash precipitators use about 300 gpm for a 30 second spray every half hour.

2. Section Rolling Mills

Section rolling mills generally have four main contact water systems:

a. High pressure descaling spray water
b. Mill stand roll and roll table spray cooling water
c. Hot shear spray cooling water
d. Flume flushing

Scarfing is also practiced at a few section mills. The combined discharge from these sources is the wastewater source regulated by the limitations and standards.

3. Flat Mills

a. Plate Mills

Plate rolling mills have three principal contact water systems:

(1) Descaling water sprays
(2) Mill stand roll and roll table water sprays
(3) Flume flushing

The combined discharge from these sources is the wastewater source regulated by the limitations and standards.

b. Hot Strip and Sheet Mills

Hot strip rolling mills generally have six principal contact water systems:

(1) Flume flushing water
(2) High pressure descaling water
(3) Low pressure roll coolant water
(4) Table roll and shear cooling waters
(5) Product cooling including runout tables
(6) Coiler cooling water

Large quantities of cooling waters are applied to cool the strip on the runout table after it has been rolled on the final mill finishing stands. This water is relatively clean and is often recycled because of its large volume.

Approximately 8% of the strip cooling waters evaporate and the balance is either recycled or further treated with the other wastewaters.

The mill scale from the finishing roll stands is much finer and is retained on a 325 mesh screen. Hot strip and combination mills require greater cooling water rates due to cooling tables and laminar water spray cooling. Laminar flow is a method of non-turbulent water flow applied over the entire surface of the strip to effect uniform surface cooling and prevent strip distortion.

The combined discharge from the sources mentioned above is the wastewater source regulated by the limitations and standards.

4. Pipe and Tube (Hot Working)

Wastewaters are generated in the hot working operation as a result of the large amounts of direct contact cooling and descaling waters required by the hot steel and the piercing, plug and reeler mill equipment.

The butt welded pipe mills generally have two types of contact wastewater systems.

a. Roll cooling spray waters
b. Pipe cooling bed water bosh

The pipe cooling bed water bosh is sometimes used to provide adequate cooling capacity without the use of excessively long pipe cooling beds. These wastewaters provide direct contact cooling and are generally discharged to the roll cooling wastewater system.

The seamless tube mills generally use two types of contact water systems:

a. Roll spray coolant waters
b. Spray water quench

Several pipe mills also have ancillary contact or process wastewaters for hydrostatic pipe testing and other miscellaneous uses. The spray quench water system is used to produce higher strength pipe and tube than that achievable by only hot working the pipe and tube. The product is quenched, reheated, and quenched again by means of water sprays. These wastewaters are handled in a manner similar to that of the roll cooling wastewaters.

Recycle Water Rates

To reduce the large volumes of wastewater discharged from hot forming operations, recycle systems are installed at most mills. These systems recirculate either treated or partially treated process water back to the mill which reduces service (makeup) water requirements and discharge flow.

The degree of recycle that can be practiced at hot forming operations is controlled primarily by product quality and temperature requirements of the process water. The water must be fairly cool since one of the principal uses of process water is to cool the rolling stands. For this study, recirculation of hot forming wastes is considered to be recycled if the water is recirculated to a hot forming operation. If the water is recirculated to a process other than hot forming, (i.e., BOF, Blast Furnace) it is considered to be reused and is considered part of the discharge flow from the hot forming mill.

Based upon these determinations, the Agency analyzed the recycle rates in hot forming operations. Recycle of scale pit process water and recycle of treated process water were considered separately. A detailed listing of recycle percentages is given in Section IX and a summary of the average recycle rates is provided below:

	Average Recycle Rate of Scale Pit Process Water*(%)	Average Overall Process Water Recycle Rate**(%)
Primary Operations	61.4	74.4
Section Operations	57.9	84.6
Flat Operations	59.6	71.2
Pipe and Tube Operations	77.0	73.5

* Average recycle rate of water from primary scale pits for flume flushing or similar process uses, for mills with recycle systems.

** Overall recycle equals the total recycle practiced at mills with recycle systems. As noted above, many mills have higher recycle rates.

Overall process water recycle rates for the better treatment systems exceed 96% for each hot forming subdivision. Zero discharge has been reported for several mills.

Wastewater Characteristics

Tables V-1 through V-15 present the raw wastewater concentrations of pollutants discharged from hot forming operations sampled for this study. Data are divided into those obtained during the original guidelines study and those obtained during the toxic pollutant study because of the diverse nature of the sampling conducted during the two studies. For the original study, only metals and limited pollutants were analyzed. However, for the toxic pollutant study, toxic metals and toxic organic pollutants were studied in addition to the previously limited pollutants.

In order to accurately characterize the raw wastewaters of hot forming operations it was necessary to isolate the contribution of these operations. The wastewater quality data in Tables V-1 through V-15 present such data.

Concentrations were calculated by subtracting all "background" amounts of each pollutant from the individual total pollutant amounts present in the wastewaters. This included pollutants in intake waters and pollutants in recycle loops, if any recycle was practiced. Only those pollutants which were present at levels equal to or greater than 0.010 mg/l in the averages of all the plants were used to characterize the raw wastewaters. These data show that toxic metals as well as some toxic organic compounds are found in wastewaters from both carbon and specialty operations. Toxic organic pollutants, however, are present at only low concentrations or are not truly representative of hot forming operations and were therefore not included in the final list of selected pollutants. Discussion concerning the final selection of wastewater pollutants is presented in Section VI.

After reviewing the net and gross concentration values of those pollutants considered for limitation in the hot forming subcategory, the Agency determined that the impact of small pollutant loadings in make-up water on effluent quality is not significant. Consequently, the effluent limitations and standards are based upon gross values. Additional discussion concerning the impact of make-up water quality is presented in Section VII.

TABLE V-1

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
ORIGINAL GUIDELINES SURVEY
HOT FORMING-PRIMARY

Net Concentration of Pollutants in Raw Wastewaters(1)

Reference Code:	0112B-01,02	0112B-03	0684H	0946A	0060	0248B	0020B	0248A	0256K	0432J	0684D	0240A	
Plant Code :	A-2	B-2	C-2	D-2	L-2(2)	D	E	H	K	M(4)	Q	R	
Sample Points :	4-(3+1)(2)	3-3p	1-3	(1+2)-(6+7)	1-2m	9-1	6-10	9-14	12-7	-	4-11(2)	6-1	Average(5)
Flow (gal/ton):	890(3)	510(3)	780(3)	700(3)	610(3)	535(3)	2740	2480(3)	5600	4490(3)	3420	4780	2200
Suspended Solids	78	56	21	37	15	78	80	127	NA	NA	47	74	65
Oil & Grease	12	150	1.5	14.2	8	49	26	1.0	NA	NA	10.8	2.4	34
pH (Units)	7.6	8.0-8.3	7.9-8.1	7.8-8.2	7.6-8.1	2.5-6.4	7.0-7.2	6.3	NA	NA	7.2-7.6	7.4-7.6	2.5 to 8.3
Chromium	NA	NA	NA	NA	NA	NA	-	0.0	NA	NA	*	0.0	*
Copper	NA	NA	NA	NA	NA	NA	0.0	0.0	NA	NA	*	0.01	*
Lead	NA	NA	NA	NA	NA	NA	0.0	0.0	NA	NA	0.0	0.0	0.0
Mercury	-	0.0003	0	0.0010	0	NA	NA	NA	NA	NA	NA	NA	*
Nickel	NA	NA	NA	NA	NA	NA	0.19	0.0	NA	NA	0.06	0.07	0.083
Zinc	NA	NA	NA	NA	NA	NA	-	*	NA	NA	0.04	0	0.017

---

(1) All values are in mg/l unless otherwise noted.
(2) Sample includes wastewater from hot forming operations other than primary.
(3) Includes flow from machine scarfing operation.
(4) No separate sample of the primary mill could be obtained.
(5) The data for Plants C-2 and R are not included in the averages, since they were later revisited as Plants 088 and 285A. The data from these later visits is more representative of current plant operations and is therefore used instead.

* : Net concentration is less than 0.010 mg/l
- : Calculation yielded negative result
0 : Zero value (included in average)
NA : Not Analyzed
ND : Not detected

Note: Negative values (-) are counted as zero in calculating averages.

TABLE V-2

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING-PRIMARY
TOXIC POLLUTANT SURVEY

Net Concentration of Pollutants in Raw Wastewaters(1)

Reference Code: Plant Code :	0496 082-140"	0496 082-140"/206"	0860H 083	0684H(2) 088	0176 081	
Sample Points :	$\frac{(G_1+H_1)}{2}$-A	$\frac{(J_2+H_2)}{2}$-A	E-(A+B)	(B+C)-(Q)	B-D	Average
Flow (gal/ton):	170(2)	460(2)	320	1700(3)	760	680
Suspended Solids	81	52	235	20	15	81
Oil & Grease	63	4	25	0.5	157	50
pH (Units)	7.7-7.9	2.6-8.9	7.0-7.1	7.9	7.9-8.1	2.6-8.9
Cadmium	0.0	0.0	0.0	0.0	0.0	0.0
Chromium	0.04	0.06	-	0.02	0.09	0.04
Copper	0.15	0.20	0.49	0.21	0.44	0.30
Cyanide	-	-	-	0.002	0.002	*
Lead	0.40	0.12	0.04	0.30	0.71	0.31
Nickel	0.51	0.32	0.10	0.12	0.21	0.25
Silver	0.0	0.0	0.0	0.0	0.0	0.0
Zinc	0.04	0.06	0.033	0.020	0.06	0.04
Chloroform	ND	ND	-	*	ND	*
Methylene Chloride	0.12	-	-	-	-	0.024
Bis-(2-ethyl hexyl) phthalate	0.13	0.17	-	-	0.003	0.061
Di-n-butyl phthalate	-	-	0.005	ND	ND	*
Di-n-octyl phthalate	ND	ND	ND	0.012	ND	*
Tetrachloroethylene	ND	ND	0.026	ND	ND	*

---

(1) All values are in mg/l unless otherwise noted.
(2) Visited earlier as Plant C-2.
(3) Includes flow from machine scarfing operation.

- : Calculation yielded negative result
* : Net concentration is less than 0.010 mg/l
0 : Zero value (included in averages)
ND : Not detected

Note: Negative values (-) are counted as zero in calculating averages.

TABLE V-3

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: PRIMARY
TOXIC METALS SURVEY

Net Concentration of Pollutants in Raw Wastewaters(1)

Reference Code:	0088D	0240A(2)	0432C	0584F	0684B	0856R	0856B	0856N	0920N	
Plant Code:	282A	285A	286A	288A	289A	290A	291	293A	294A	
Sample Points:	B-A	B-A	C-K-A	B-A	B-A	B-A	A-B-C	B-A	C-A-D	Average
Flow (gal/ton):	5050	2320	2190	820	1050	6400	2340	2250	4310	2970
Suspended Solids	NA	43.7	NA	51.3	NA	27.0	113	37.3	54.1	54.4
Oil and Grease	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH (units)	NA	7.9 - 8.1	NA	NA	NA	7.5 - 7.7	7.0 - 7.3	NA	7.1	7.0 - 8.1
Chromium	1.47	0.15	0.030	ND	NA	0.027	0.0	0.024	0.0	0.21
Copper	2.41	0.22	0.13	0.057	NA	0.040	0.075	0.021	0.051	0.38
Lead	0.088	0.18	0.12	0.011	NA	0.0	0.12	0.099	0.0	0.077
Nickel	1.10	0.38	0.013	ND	NA	0.0	0.071	0.033	0.0	0.20
Zinc	0.39	-	2.81	0.013	NA	0.003	0.023	-	0.027	0.41

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(1) All values are in mg/l unless otherwise noted.
(2) Visited earlier as Plant R.

- : Calculation yielded negative result. Result is counted as zero in calculating averages.
NA: Not Analyzed
ND: Not Detected

Note: All plants perform scarfing except Plant 289A.

TABLE V-4

SUMMARY OF ANALYTICAL DATA OF SAMPLED PLANTS
HOT FORMING-SECTION
ORIGINAL GUIDELINES STUDY
NET CONCENTRATION OF POLLUTANTS IN RAW WASTEWATERS(1)

Reference Code:	0240A	0176	0684D	0432J	0424	0284A&B	0256	0176(2)	0112B
Plant Code :	R	O	Q	M	C	H	K	O	A-2
Sample Points :	4-1	(3)	8-10	6-9	8-5	13-14	10-7	1-2	4-3
Flow (gal/ton):	7960	NA	1780	670	5260	4210	1470	4970	600
Suspended Solids	25	NA	30	53.6	36.8	44	63	-	86.3
Oil & Grease	3.3	NA	1.2	9.7	1.0	7.8	3.5	3.4	13.9
pH (Units)	7.1	NA	7.5	6.5	5.1	6.2	7.2	8.4	7.6
Chromium	0.0	NA	-	0.07	0.0	0.0	0.0	-	NA
Copper	0.0	NA	0.01	0.0	0.0	0.0	0.05	-	NA
Nickel	0.06	NA	ND	0.11	0.11	0.0	-	0.0	NA
Zinc	0.02	NA	0.04	-	0.011	0.0	-	0.0	NA

TABLE V-4
SUMMARY OF ANALYTICAL DATA OF SAMPLED PLANTS
HOT FORMING-SECTION
ORIGINAL GUIDELINES STUDY
NET CONCENTRATION OF POLLUTANTS IN RAW WASTEWATERS(1)
PAGE 2

Reference Code:	0291C	0291C	0291C	0196A	0196A	0384A	0640A	0432A	08560	
Plant Code :	D-2 No.5 Bar	D-2 No.2 Bar	D-2 No.6 Bar	E-2 Rod	E-2 Bar	F-2*	G-2	H-2	I-2	Average
Sample Points :	5-6-7	4-6-7	(4)	2-4-6	3-4	(2-3)	1-(2+4)	(3-1)	(2-6)	
Flow (gal/ton):	9560	9740	8400	8820	3170	1910	14,020	6950	5010	5600
Suspended Solids	25.8	38.3	NA	67.2	27	12.7	22.2	33	124	46
Oil & Grease	15.0	9.8	NA	11.1	-	-	0.5	13.8	1.4	6.1
pH (Units)	8.0-8.1	8.0-8.1	NA	8.2-8.3	8.2-8.3	7.7	7.7	6.6	7.6	5.1-8.3
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.012
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.01
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.047
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	C.012

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(1) All values are in mg/l unless otherwise noted.
(2) The data for Plant O is not included in the averages since it was later revisited as Plant 081. The data from this later visit is more representative of current plant operations and is therefore used instead.
(3) A separate sample of the section mill could not be obtained.
(4) There is insufficient information available to allow a net calculation.

- : Calculations yielded negative result
* : Includes scarfing flow
NA : Not analyzed or not available
ND : Not detected

NOTES: a. Negative values counted as zero in average calculations.
b. Because of the difficulty in sampling the raw wastes directly from the operations, the sampling results shown above are all based on the mills' discharge from the primary scale pits.

TABLE V-5

SUMMARY OF ANALYTICAL DATA OF SAMPLED PLANTS
TOXIC POLLUTANT STUDY
HOT FORMING-SECTION
NET CONCENTRATION OF POLLUTANTS IN RAW WASTEWATERS(1)

Reference Code: Plant Code : Sample Points : Flow (gal/ton):	0176(2) 081-1&2 (C-D) 3570	0860H 083 34" (G-B-A) 4690	0860H 083 Rod (K-B-R-A) 6930	0432A 087-14" (D-B) 6340	0684H 088-10"/11" (T-V) 3400	0684H 088-34" (F-Q) 580	088-36"Billet (D+E-Q) 4710	0684H 088-32" (G-Q) 930	0684H 088-14"(3) 4800	0684H 081-#4Hot (F-A)(4) 8229	Average 4290
Suspended Solids	0	26	199	23	34	20	18	27	NA	84	47.8
Oil & Grease	4	37	8	1	10	-	-	7	NA	251	35.3
pH (Units)	7.9	6.9	7.4	7.3	7.5	7.7	7.9	7.8	NA	7.2	6.9-7.9
Cadmium	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0.0	0.0
Copper	-	0.051	0.070	0.024	0.01	0.08	0.13	0.08	NA	0.12	0.063
Nickel	0.16	0.0	0.070	0.0	0.01	0.08	0.04	0.05	NA	0.82	0.14
Zinc	-	0.013	0.029	0.076	0.19	0.02	0.01	0.02	NA	0.06	0.05
Methylene Chloride	-	-	-	0.0	0.19	0.003	0.10	0.0065	NA	-	0.033
Naphthalene	ND	ND	ND	ND	0.0	0.0	0.0	ND	NA	ND	0.0
2,4 Dinitrophenol	-	-	-	ND	0.014	0.013	ND	ND	NA	ND	*
Bis(2-Ethylhexyl)phthalate	0.015	-	-	0.027	1.28	-	-	0.37	NA	0.16	0.21
Butyl Benzyl Phthalate	0.014	0.012	-	ND	-	ND	ND	ND	NA	ND	*
Dimethyl Phthalate	ND	ND	ND	ND	0.0	ND	0.0	0.0	NA	ND	0.0
Pyrene	0.0	ND	0.0	ND	ND	ND	ND	ND	NA	ND	0.0

---

(1) All values are in mg/l unless otherwise noted.
(2) Visited earlier as Plant O.
(3) Insufficient samples to allow calculation of the net concentrations.
(4) Some company supplied analytical data was used for net concentration calculation.

* : Average is less than 0.010 mg/l
- : Calculation yielded negative results
ND : Not Detected
NA : Not Available

NOTE: Because of the difficulty in sampling the raw wastes directly from the operations, the sampling results shown above are all based on the mills' discharge from their primary scale pit.

TABLE V-6

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: SECTION
TOXIC METALS SURVEY

Net Concentration of Pollutants in Raw Wastewaters(1)

Reference Code:	0088D	0112	0240A	0856R	0856N	
Plant Code:	282B	283	285B	290B	293B	
Sample Points:	B-A	B-A	C-A	C-D-A	C-A	Average
Flow (gal/ton)	6450	1850	2600	950	2990	2970
Suspended Solids	NA	NA	19.6	3.2	28.3	17.0
Oil and Grease	NA	NA	NA	NA	NA	NA
pH (units)	NA	NA	8.0 - 8.1	8.6 - 8.7	NA	8.0 - 8.7
Chromium	0.11	0.006	0.036	0.027	0.010	0.038
Copper	0.068	0.070	0.029	0.11	-	0.055
Lead	0.027	0.035	0.019	0.053	-	0.027
Nickel	0.068	0.033	0.21	0.040	0.012	0.073
Zinc	0.036	0.027	-	-	-	0.013

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(1) All values are in mg/l unless otherwise noted.

* : Net concentration is less than 0.010 mg/l
- : Calculation yielded negative result. Result is counted as zero in calculating averages.
NA: Not Analyzed

TABLE V-7

SUMMARY OF ANALYTICAL DATA OF SAMPLED PLANTS
ORIGINAL GUIDELINES STUDY
HOT FORMING: HOT STRIP & SHEET
NET CONCENTRATION OF POLLUTANTS IN RAW WASTEWATERS$^{(1)}$

Reference Code	0248B	0020B$^{(2)}$	0176	0860H$^{(4)}$	0060	0384A	0396D	Average
Plant Code	D	E	O$^{(3)}$	J-2	L-2	M-2	N-2	
Sample Points	(6-1)	(7-10)	NA	(1+3+4)-6	(1-2)	(2+3)-5	(6-7)	
Flow (gal/ton)	3310	4520	NA	7850	4520	8440	7270	5890
Suspended Solids	31	23	NA	6.6	11	11	15	16.3
Oil & Grease	16.4	13.6	NA	0.6	4.2	1.7	0.0	6.1
pH	6.3	5.9-6.1	NA	7.3-8.3	7.6-8.1	8.4	7.3-7.5	6.3-8.4
Chromium	-	-	NA	NA	NA	NA	NA	-
Copper	0.0	-	NA	NA	NA	NA	NA	0.00
Mercury	NA	NA	NA	0.0	0.0	0.0	0.0	0.0
Nickel	0.13	0.0	NA	NA	NA	NA	NA	0.065
Zinc	-	-	NA	NA	NA	NA	NA	0.00

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(1) All values are in mg/l unless otherwise noted.

(2) The data for Plant E is not included in the averages since it was later revisited as Plant 281. The data from this later visit is more representative of current plant operations and is therefore used instead.

(3) A separate sample of the strip mill could not be obtained.

(4) The data for Plant J-2 is not included in the averages since it was later revisited as Plant 292. The data from this later visit is more representative of current plant operations and is therefore used instead.

NA : Not Analyzed or Not Available

TABLE V-8

SUMMARY OF ANALYTICAL DATA OF SAMPLED PLANTS
TOXIC POLLUTANT SURVEY
HOT FORMING: FLAT-HOT STRIP AND SHEET
NET CONCENTRATIONS OF POLLUTANTS IN RAW WASTEWATER(1)

Reference Code	0112D	0432A	
Plant Code	086(80" Mill)(2)	087 (44" Mill)	Average
Sample Points	(B-A)	(C-B)	
Flow (gal/ton)	5720	4670	4670
Suspended Solids	41	18	18
Oil and Grease	6	3	4
pH (Units)	8.0-8.1	7.4-7.6	7.4-7.6
Beryllium	NA	0.0	0.0
Cadmium	0.0	0.0	0.0
Chromium	0.0	0.01	0.01
Copper	-	-	0.0
Lead	0.0	0.0	0.0
Nickel	0.01	0.0	0.0
Silver	0.0	0.0	0.0
Zinc	0.02	-	0.0
Phenolic Compounds	0.028	0.0	0.014
Chloroform	ND	0.018	0.009
Methylene Chloride	0.013	-	*
2,4-Dinitrophenol	0.028	ND	0.014
Bis-(2-ethyl hexyl) phthalate	0.28	-	0.14
Butyl benzyl phthalate	0.024	ND	0.012
Di-n-butyl phthalate	0.006	0.027	0.016

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(1) All values are expressed in mg/l unless otherwise noted.

(2) The data for Plant 086 (with the exception of the organic data) is not included in the averages since it was later revisited as Plant 284A. The data from this later visit is more representative of current plant operations and therefore is used instead.

ND: Not Detected
NA: Not Analyzed
- : Calculations yielded a negative value
* : Less than 0.010 mg/l

TABLE V-9

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: FLAT - HOT STRIP AND SHEET

Net Concentration of Pollutants in Raw Wastewaters(1)

Reference Code:	0020B	0112D	0432C	0584B	0584F	0684B	0860B	0920N	
Plant Code:	281(2)	284A(3)	286B	287	288B	289B	292(4)	294B	
Sample Points:	B-A	B-A-D	(D+E)-(A+K)	B-A	C+D-A	D-E	B+C-A	F+G+I(5) -A-B	Average
Flow (gal/ton):	5690	6110	3500	4150	3160	6660	3280	8200	5090
Suspended Solids	109	60.4	NA	41.7	52.7	24.6	26.9	NA	52.6
Oil and Grease	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH (units)	6.7 - 7.1	NA	NA	NA	NA	7.5 - 7.8	NA	NA	6.7 - 7.8
Chromium	0.60	0.003	0.56	0.039	0.0063	0.005	0.005	NA	0.17
Copper	0.083	0.022	0.027	0.006	0.0069	0.003	0.007	NA	0.022
Lead	0.0	0.0	0.020	0.0	0.0	0.006	0.0	NA	*
Nickel	0.61	-	0.26	0.0	0.0	-	0.0	NA	0.12
Zinc	0.068	0.0015	0.0039	0.007	0.00042	0.030	0.018	NA	0.018

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(1) All values are in mg/l unless otherwise noted.
(2) Visited earlier as Plant E.
(3) Visited earlier as Plant 086.
(4) Visited earlier as Plant J-2.
(5) Insufficient flow information to allow calculation of net concentration.

* : Net concentration is less than 0.010 mg/l
- : Calculation yielded negative result. Result is counted as zero in calculating averages.
NA: Not Analyzed

TABLE V-10

SUMMARY OF ANALYTICAL DATA OF SAMPLED PLANTS
ORIGINAL GUIDELINES STUDY
HOT FORMING - PLATE
NET CONCENTRATION OF POLLUTANTS IN RAW WASTEWATERS(1)

Reference Code	0856H	0868B	Average
Plant Code	F	K-2	
Sample Points	(7-9)	(1-2)	
Flow (gal/ton)	4290	3,690	3990
Suspended Solids	85	56	71
Oil & Grease	50.9	4.6	27.8
pH (units)	6.3-6.7	6.9-7.1	6.3-7.1
Chromium	0.01	NA	*
Copper	0.0	NA	0.00
Mercury	NA	0.0	0.00
Nickel	0.48	NA	0.24
Zinc	0.02	NA	0.01

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(1): All values are in mg/l unless otherwise noted.
NA: Not Analyzed
* : Less than 0.010 mg/l

NOTE: Because of the difficulty in sampling the raw wastes directly from the operations, the sampling results shown above are all based on the mills' discharge from the primary scale pit.

TABLE V-11

SUMMARY OF ANALYTICAL DATA OF SAMPLED PLANTS
TOXIC POLLUTANT SURVEY
HOT FORMING: FLAT-PLATE
NET CONCENTRATIONS OF POLLUTANTS IN RAW WASTEWATERS(1)

Reference Code	0496	0496	0496	0496	0496	0860H	0112D	
Plant Code	082-112"/120"	082-112"/120"	082-140"	082-140"	082-140"/206"	083-30"	086-160"	
Sample Points	D-A	C-A	H-A	G-A	J-A	I-(B+A)	H-A	Average
Flow (gal/ton)	870	2,650	120	140	210	9,820	3,220	2,300
Suspended Solids	22	31	65	109	25	12	30	44
Oil and Grease	8	6	34	60	4	10	13	20
pH (Units)	7.2	7.5	7.7-8.9	7.8	7.4	7.2-7.3	8.0-8.2	7.2-8.9
Chromium	0.0	0.12	0.04	0.07	0.04	-	0.0	0.04
Copper	0.18	0.15	0.11	0.18	0.20	0.06	0.04	0.15
Lead	0.04	0.0	0.26	0.47	0.02	0.0	0.0	0.13
Nickel	0.11	0.28	0.33	0.94	0.13	0.02	0.06	0.30
Silver	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zinc	0.05	0.04	0.03	0.05	0.05	0.04	0.03	0.04
Benzene	0.012	-	-	-	-	ND	ND	*
2,4-Dimethylphenol	0.014	ND	ND	ND	ND	ND	ND	*
Methylene Chloride	-	-	0.024	0.14	0.013	-	ND	0.025
4-Nitrophenol	ND	0.017	ND	ND	ND	-	0.007	*
Pentachlorophenol	0.012	ND	ND	ND	ND	-	ND	*
Bis-(2-ethyl hexyl) phthalate	0.60	0.59	0.15	-	0.012	-	0.82	0.31
Di-n-butyl phthalate	-	-	-	-	-	ND	ND	0.0
Diethyl phthalate	ND	ND	ND	ND	ND	-	ND	0.0

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(1) All values are in mg/l unless otherwise noted.
(2) The data for Plant 086 (with the exception of the organic data) is not included in the averages since it was later revisited as Plant 284B. The data from this later visit is more representative of current plant operations and therefore is used instead.

*: Less than 0.010 mg/l
-: Calculations yielded a negative value
NA: Not Analyzed
ND: Not Detected

TABLE V-12

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: FLAT-PLATE
TOXIC METALS SURVEY

Net Concentration of Pollutants in Raw Wastewaters(1)

Reference Code:	112D
Plant Code:	284B(2)
Sample Points:	C-A-D
Flow (gal/ton):	8830
Suspended Solids	40.1
Oil and Grease	NA
pH (units)	NA
Chromium	0.013
Copper	0.031
Lead	-
Nickel	0.0
Zinc	-

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(1) All values are in mg/l unless otherwise noted.
(2) Visited earlier as Plant 086.

* : Net concentration is less than 0.010 mg/l.
- : Calculation yielded negative result. Result is counted as zero in calculating averages.
NA: Not Analyzed

TABLE V-13

SUMMARY OF ANALYTICAL DATA OF SAMPLED PLANTS
HOT WORKING PIPE AND TUBE
ORIGINAL GUIDELINES SURVEY

Net Concentrations of Pollutants in Raw Wastewaters

Reference Code	0196A	0240B	0916A	0728	0256G	Average
Plant Code	E-2	GG-2	II-2	JJ-2	KK-2	
Sample Points	(1-6)	(1-4)	(1-5)	2-(1+3)	(1-3)	
Flow (gal/ton)	12,800	1,700	2,760	2,290	520	4,010
Suspended Solids	27	40	224	102	61	91
Oil and Grease	13.4	7.3	2.2	6.7	-	5.9
pH (Units)	8.2-8.7	7.0-7.8	7.0	6.8-6.9	6.8-7.1	6.8-8.7
Beryllium	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA
Phenolic Compounds	NA	NA	NA	NA	NA	NA

-: Calculations yielded a negative value

NA: Not Analyzed

TABLE V-14

SUMMARY OF ANALYTICAL DATA OF SAMPLED PLANTS
HOT WORKING PIPE AND TUBE
TOXIC POLLUTANT SURVEY

Net Concentrations of Pollutants in Raw Wastewaters(1)

Reference Code	0432A	0684H	
Plant Code	087	088	Average
Sample Points	(E-B)	(I+J+K+L)-Q	
Flow (gal/ton)	8,080	7,010	7,540
Suspended Solids	27	31	29
Oil and Grease	2	1.9	2
pH (Units)	7.1-7.4	7.2-7.8	7.1-7.8
Beryllium	0.0	NA	0.0
Cadmium	0.0	0.0	0.0
Chromium	0.0	0.004	*
Copper	0.009	0.071	0.040
Lead	-	0.028	0.014
Nickel	0.25	0.080	0.16
Silver	0.0	0.0	0.0
Zinc	-	0.027	0.014
Phenolic Compounds	0.0	0.0	0.0

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(1) All values are expressed in mg/l unless otherwise noted
* : Less than 0.010 mg/l
NA: Not analyzed
ND: Not detected

TABLE V-15

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: PIPE AND TUBE
TOXIC METALS SURVEY

Net Concentration of Pollutants in Raw Wastewaters(1)

Reference Code:	0856N	0948A	
Plant Code:	293C	295	
Sample Points	D-A	B-A	Average
Flow (gal/ton)	2140	5620	3880
Suspended Solids	-	121	61
Oil and Grease	NA	NA	NA
pH (units)	NA	7.2 - 7.5	7.2 - 7.5
Chromium	-	0.060	0.030
Copper	-	0.18	0.090
Lead	-	0.091	0.046
Nickel	-	0.020	0.010
Zinc	-	-	0.0[illegible]

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(1) All values are in mg/l unless otherwise noted.

* : Net concentration is less than 0.010 mg/l
- : Calculation yielded negative result. Result is counted as zero in calculating averages.
NA: Not Analyzed

HOT FORMING SUBCATEGORY

SECTION VI

WASTEWATER POLLUTANTS

Introduction

This section describes the selection, rationale for selection, and the process sources of those pollutants characteristic of hot forming operations. As a first step in the selection procedure, the Agency developed a list of pollutants considered to be most representative or characteristic of hot forming processes. This initial list of pollutants was confirmed and augmented with data collected from extensive field sampling programs which included analysis for toxic pollutants. A review of the monitoring data from all of the field sampling programs formed the basis for the final selection of pollutants for hot forming operations. On the basis of the expected and observed similarities among hot forming operations, a common list of selected pollutants was developed for the four hot forming subdivisions.

Conventional Pollutants

Suspended solids, oil and grease, and pH were the three pollutants limited by the BPT limitations promulgated in 1976. Suspended solids was chosen as a limited pollutant based upon the large quantities of scale generated by the hot forming processes. As noted in Section V, these scale particles enter the process wastewaters as a result of the application of water on the steel product and roll stands. Suspended solids also indicate the degree of process wastewater contamination and can be used as a measure of treatment performance. Various other pollutants, including the toxic metals, are often entrained within the suspended particulate matter; thus, suspended solids removal results in the removal of other pollutants as well.

The Agency selected oil and grease since many lubricants are used in hot forming processes. Oils and greases are present in hot forming wastewaters as a result of oil conditioning, oil spills, line breaks, leaks, excessive application of lubricants, and equipment washdown.

Finally, pH, a measure of the acidity or alkalinity of a wastewater, was chosen due to the environmentally detrimental effects which can result from extremes in pH. In addition, extremes in pH can cause problems, such as corrosion and scaling, to process and wastewater treatment equipment and facilities. The pH of hot forming process wastewaters typically falls within the range of 6.0 to 9.0 without control.

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Toxic Pollutants

This study also considered the discharge of toxic pollutants. Initially, all pollutants classified as "known to be present" were included. This classification was made on the basis of industry responses to the DCPs, and analyses performed during the screening phase of this project. Table VI-1 lists toxic pollutants selected on the basis of the above considerations.

Upon completion of the analyses of the hot forming wastewaters for the various pollutants, the Agency determined those pollutants which were found at 0.010 mg/l or greater in the raw wastewaters. As discussed in Section V, net concentrations of these pollutants were calculated by subtracting concentrations found in "background" waters. Table VI-2 presents average net concentrations for all pollutants analyzed in Section V for the major hot forming subdivisions. The final toxic pollutant list was developed by including only those pollutants (except the toxic organics discussed below) in Table VI-2 which appeared at average net concentrations of 0.010 mg/l or greater. Table VI-3 shows this final list of toxic pollutants as well as original BPT limited pollutants. The Agency believes that these pollutants are considered to be most representative and indicative of hot forming operations and are addressed accordingly throughout this report.

The toxic metal pollutants enter the hot forming process wastewaters from the product scale and potentially from other sources. The five toxic metal pollutants (refer to Table IV-3) are used to characterize all hot forming wastewaters. These toxic metals are found above treatability levels in the process wastewaters of all hot forming subdivisions.

The list of selected pollutants does not include toxic organic pollutants. Although several toxic organic pollutants were detected at levels greater than 0.010 mg/l in some of the hot forming subdivisions, various factors mitigated against the selection of these pollutants. In the case of methylene chloride and the phthalates, these pollutants are considered to be artifacts (i.e., resulting from sampling or laboratory procedures) and are not believed to be contributed by hot forming operations. The remaining toxic organic pollutants (e.g., phenol, 2,4-dinitrophenol) were not included in the final list because of their presence at such low levels which indicate that, aside from recycle, specific treatment for organic pollutant removal is generally not feasible. The Agency believes that those pollutants do not tend to concentrate in recycle systems. Although the concentrations of those pollutants in recycle system blowdowns will be approximately the same as the discharge from once-through systems, the mass loadings of those pollutants will generally be reduced proportionately to the degree of recycle.

TABLE VI-1

PRIORITY POLLUTANTS KNOWN TO BE PRESENT HOT FORMING SUBCATEGORY

Priority Pollutant Numeric Designation	Pollutant Parameter
65	Phenol
66	Bis(2-ethylhexyl)Phthalate
85	Tetrachloroethylene
118	Cadmium
119	Chromium
120	Copper
121	Cyanide
122	Lead
123	Mercury
124	Nickel
125	Selenium
126	Silver
127	Thallium
128	Zinc

TABLE VI-2

SUMMARY OF NET PRIMARY SCALE PIT EFFLUENT CONCENTRATIONS(1)
HOT FORMING SUBCATEGORY

Parameter	Primary	Section	Hot Strip & Sheet	Plate	Pipe & Tube
Flow(gal/ton)	2170	4750	5300	3400	4770
Total Suspended Solids	66	43	36	49	79
Oil & Grease	40	20	5.2	22	4.8
pH (units)	2.5 - 8.9	5.1 - 8.7	6.3 - 8.4	6.3 - 8.9	6.8 - 8.7
Beryllium	0.0	0.0	0.0	0.0	0.0
Cadmium	0.0	0.0	0.0	0.0	0.0
Chromium	0.16	0.024	0.14	0.037	0.016
Copper	0.28	0.045	0.017	0.11	0.065
Cyanides	*	0.0	0.0	0.0	0.0
Lead	0.14	0.027	*	0.11	0.030
Mercury	*	0.0	0.0	0.0	0.0
Nickel	0.19	0.094	0.11	0.29	0.088
Silver	0.0	0.0	0.0	0.0	0.0
Zinc	0.22	0.028	0.014	0.035	0.0068
Benzene	0.0	0.0	0.0	*	0.0
Chloroform	*	0.0	0.009	0.0	0.0
2,4 Dimethylphenol	0.0	0.0	0.0	*	0.0
Methylene Chloride	0.024	0.033	*	0.025	0.0
Napthalene	0.0	0.0	0.0	0.0	0.0
2,4 Dinitrophenol	0.0	*	0.014	0.0	0.0
4 - Nitrophenol	0.0	0.0	0.0	*	0.0
Pentachlorophenol	0.0	0.0	0.0	*	0.0
Phenolic Compounds	0.0	0.0	0.014	0.0	0.0
Bis-(2 ethyl hexyl) phthalate	0.061	0.21	0.14	0.31	0.0
Butyl benzyl phthalate	0.0	*	0.012	0.0	0.0
Di-n-butyl phthalate	*	0.0	0.016	0.0	0.0
Di-n-octyl phthalate	*	0.0	0.0	0.0	0.0
Diethyl phthalate	0.0	0.0	0.0	0.0	0.0
Dimethyl phthalate	0.0	0.0	0.0	0.0	0.0
Tetrachloroethylene	*	0.0	0.0	0.0	0.0
Pyrene	0.0	0.0	0.0	0.0	0.0

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(1) All values are in mg/l unless otherwise noted.

* Less than 0.010 mg/l
Note: Averages for each subdivision include only those plants which were included in the individual averages, on the preceding tables.

TABLE VI-3

SELECTED POLLUTANTS
HOT FORMING SUBCATEGORY

	Suspended Solids
	Oil and Grease
	pH
119	Chromium
120	Copper
122	Lead
124	Nickel
128	Zinc

HOT FORMING SUBCATEGORY

SECTION VII

CONTROL AND TREATMENT TECHNOLOGY

Introduction

A review of the control and treatment technologies currently in use or available for use in the hot forming subcategory provided the basis for the development of the BPT, BAT, BCT, NSPS, PSES, and PSNS alternative treatment systems. This review involved summarizing questionnaire and plant visit data to identify those treatment components and systems in use at hot forming operations. Capabilities, either demonstrated or based on treatment of similar wastewaters, were used in evaluating those advanced treatment technologies for toxic metal pollutant removal. The above considerations were then used to determine which treatment components and systems are most appropriate for the various levels of treatment. This section presents a summary of the treatment practices currently in use or available for use for the treatment of hot forming process wastewaters.

This section also presents raw wastewater and treated effluent data for the plants sampled, as well as the methods used to determine wastewater loads and actual raw wastewater quality. As noted previously, raw wastewater samples could only be obtained following primary scale pits at most plants. The analytical data, from the toxic pollutant surveys along with long-term effluent monitoring data obtained from the industry, were used to establish treatment system capabilities. Also included in this section are descriptions of the treatment systems at each of the sampled plants.

Summary of Treatment Practices Currently Employed

As noted previously, wastewaters generated in the various hot forming processes are similar in character, and as a result, the treatment technologies in use at these operations are basically the same. A survey of the treatment components in use indicates that the following basic treatment units are prevalent: primary sedimentation, surface oil removal, secondary settling or filtration, and recycle. Over ninety-six percent of all hot forming operations have primary scale pits to collect and recover the heavier suspended particulate matter and to allow the tramp oils to float to the surface. These pits are cleaned either frequently or continuously in order to prevent excess solids accumulation. Slotted tube, rope, or belt-type oil skimmers are the principal devices in use for surface oil removal. The efficiency of scale pits is dependent upon design. At many mills a portion of the scale pit discharge is recycled to the process for flume flushing. The scale pit discharges which are not recycled,

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typically undergo physical/chemical treatment prior to discharge or recycle to the process.

Referring to Tables III-2 through III-7, the following treatment technologies are in use at many hot forming operations:

A. Scale Pit or similar type settling basin

Intended to provide primary sedimentation of the raw process wastewaters and oil separation.

B. Surface Skimming

The various tramp oils inherent in mill operations are removed from the surface of the wastewater (generally during primary settling).

C. Clarifiers or Thickeners

These components provide additional suspended solids removal. Settling lagoons and secondary scale pits are also capable of providing the same degree of treatment as clarifiers or thickeners.

D. Vacuum Filters

These filters are used to dewater the sludges removed from various sedimentation operations, principally clarifiers and thickeners.

E. Filters

These components can provide a higher degree of suspended solids removal than attainable with sedimentation facilities.

F. Recycle

A portion of the effluent from one or more of the treatment system components is recycled to the process.

Hot forming wastewaters are often treated in central treatment facilities in which wastewaters from several hot forming mills (or, in many instances, wastewaters from other subcategories) are combined for treatment. With this type of facility, advantage can be taken of the economies of scale and the ease of centralized process control.

Control and Treatment
Technologies Considered for BAT, BCT, NSPS, PSES, and PSNS

In order to achieve high wastewater recycle rates (greater than 90 percent) for hot forming operations, an evaporative cooling tower is normally used to reduce the temperature of the recycled water. It should be noted that cooling towers are used at many hot forming operations as major components in high recycle rate systems. Heat load reduction is necessary to ensure sufficient roll cooling capability and to minimize fog formation in the mill. Treatment at some mills includes a high degree of recycle without cooling towers.

Because of the presence of toxic organic and toxic metal pollutants in hot forming process wastewaters, the Agency considered advanced levels of treatment in the BAT, NSPS, PSES, and PSNS alternative treatment systems in addition to recycle. Each of the technologies considered are reviewed below.

Evaporation

Vapor compression distillation, in which a wastewater with a high dissolved solids level (the treatment system blowdown) is concentrated to a slurry consistency, was considered as an alternate means of attaining zero discharge in the hot forming subcategory. The resulting slurry would be dried by various means while the distillate quality effluent would be recycled to the process. However, this technology was not seriously considered because of high energy requirements and attendant high costs. Zero discharge is reported to be achieved by the industry at many hot forming operations without evaporative technology. However, the Agency believes that zero discharge cannot be achieved on an industry-wide basis for hot forming operations without the use of evaporative technologies.

Summary of Monitoring Data

Raw wastewater and effluent data for the hot forming operations which were visited are presented by subdivision in Tables VII-2 through VII-9. Table VII-1 provides a legend for the various control and treatment technology abbreviations used on the above tables and in other tables throughout this report. The concentration values presented represent, except where footnoted, averages of measured values. In some cases these data were obtained from central treatment systems.

In several instances, the effluent waste loads (lbs/1000 lbs) for certain central treatment operations indicated on the analytical data tables, represent apportioned loads. In these central treatment systems, the Agency determined the percentage contribution of an individual operation to the total treatment system influent load and subsequently applied this contribution to the total effluent load. This procedure was repeated for each pollutant. By using this procedure, the Agency assessed the effects of treatment on the waste loads of an individual process which discharges to a central treatment facility.

As a supplement to the sampled plant analytical data, long-term effluent analytical data from D-DCPs are presented on Table VII-10. These data are presented as a means of demonstrating treatment capabilities and consistency over an extended period.

As mentioned previously, nearly all raw wastewater samples were obtained from primary scale pit effluents. Therefore, other methods were needed to determine raw process wastewater characteristics. Data provided by the D-DCP respondents served as the basis for establishing the levels of raw wastewater suspended solids and oil and grease.

Since suspended solids in hot forming wastewaters are almost entirely due to scale generation in the hot forming process, a determination of the quantities of scale generated provides a reasonable estimate of suspended solids levels present in process wastewaters. As a result of similar scale generation rates and wastewater characteristics, the Agency averaged mill scale generation data from all D-DCP respondents to derive a single scale generation rate for application to all hot forming operations. These data are presented in Table VII-11. The average product loss of approximately 2.1% represents a scale generation rate and resulting suspended solids loading of 42 lbs of solids per ton of production. This solids loading was then applied to the various treatment model sizes and raw wastewater flow rates to determine raw wastewater suspended solids levels for each treatment system. It must be noted that the above rate applies only to mills without machine scarfer operations. A review of available information indicates that primary mills with scarfing operations generate about twice as much suspended solids than those systems without scarfing.

Raw wastewater oil and grease levels were also established on the basis of data provided in the D-DCP responses. Virtually all of the oils and greases present in hot forming wastewaters are present as a result of leakages or spills of oils (i.e., lubricants) which are immiscible in water. Based on the data received from the D-DCP respondents, the Agency determined an average oil and grease generation rate of 0.23 gallons/ton (Table VII-11). This volume is equivalent to a mass generation rate of 1.6 lbs/ton. This rate was applied to each treatment system as discussed above for suspended solids. Oil generation rates much greater than this value are considered to be the result of inadequate maintenance and operational control.

Plant Visits

Brief descriptions of the visited plants are presented below. Treatment system flow schematics are provided at the end of this section.

Plant C (0424) - Figure VII-1 (Section)

The wastewaters from the specialty bar mills at Plant C empty into a cooling reservoir which receives wastewaters from other processes as well. A portion of the reservoir overflow is discharged to a receiving stream, while the remaining overflow is recycled to the process.

Plant D (0248B) - Figure VII-2 (Primary)

Universal mill (specialty) wastewaters discharge to a scale pit equipped with oil removal facilities. The scale pit effluent of this once-through system is discharged to a receiving stream.

Plant D (0248B) - Figure VII-3 (Flat)

This plant provides once-through treatment for specialty hot strip mill wastewater. Wastewater is pumped to primary scale pits and then discharged to a receiving stream after mixing with wastewater from the universal mill mentioned above.

Plant E (0020B) - Figure VII-4 (Primary)

Specialty steel hot strip, blooming and universal mills are treated in a central treatment system. After first passing through primary scale pits, the wastewaters then discharge to a main collection sump which discharges to two clarifiers. The clarifier overflow is pumped through deep bed filters and then discharged to a receiving stream. The filter backwash is returned to the clarifiers.

Plant F (0856H) - Figure VII-5 (Flat)

Plant F has a once-through process wastewater system for a specialty plate mill. Wastewaters flow through a primary scale pit and then are discharged to a receiving stream. Reheat furnace noncontact cooling water also flows through the primary scale pit.

Plant H (0248A) - Figure VII-6 (Primary)

Plant H practices once-through treatment of its specialty steel blooming mill wastewaters. Scarfer wastewater, reheat furnace cooling water, and blooming mill wastewater all empty into the same scale pit and discharge to a receiving stream.

Plant H (0248A) - Figure VII-7 (Section)

Merchant mill wastewaters are pumped to a scale pit and discharged to a receiving stream by this specialty mill. No recycle is employed at this mill.

Plant K (0256K) - Figure VII-8 (Primary)

The treatment facility for this specialty blooming mill incoporates a recycle system with a blowdown to a receiving stream. Treatment includes a primary scale pit with oil removal facilities.

Plant K (0256K) - Figure VII-9 (Section)

This specialty bar mill's process effluent discharges to a scale pit from where it is discharged to a receiving stream. No recycle is employed at this mill.

Plant M (0432J) - Figure VII-10 (Primary)

This specialty steel plant's wastewater treatment system serves primary and section rolling mills (blooming mill, billet mill, and bar mill).

The primary mill wastewaters, including hot scarfer wastewater, are discharged to a primary scale pit. The scale pit effluent is recycled to the mills and hot scarfer with a blowdown going to a sump pit which receives section mill wastewaters. Overflow from this sump pit is discharged to a spray pond and to a POTW. Water is recycled from the spray ponds to the mills after the addition of cooling water makeup.

Plant M (0432J) - Figure VII-11 (Section)

The wastewater treatment system for this specialty plant serves several mills including a billet bar mill, a blooming mill and a bar mill. Bar mill wastewater is pumped to a sump pit along with other mill wastewaters. A portion of the sump pit effluent is discharged while the remainder is pumped to a spray pond and is subsequently recycled.

Plant O (0176) - Figure VII-12 (Section and Flat)

The wastewater treatment system for these specialty mills is a combined system serving both rod and strip mills. Wastewaters are discharged to a scale pit, then recycled to these mills. A blowdown is discharged to a central wastewater treatment facility.

Plant Q (0684D) - Figure VII-13 (Primary)

This specialty blooming mill employs a once-through system which uses a scale pit and oil skimming equipment to treat process wastewaters. Other plant process wastewaters discharge to the scale pit as well. The scale pit overflow is discharged to a receiving stream.

Plant Q (0684D) - Figure VII-14 (Section)

The wastewaters from the specialty bar mills at Plant Q are delivered to a scale pit equipped with oil removal facilities. All process wastewaters are discharged on a once-through basis from the scale pit to a receiving stream.

Plant R (0240A) - Figure VII-15 (Section)

Wastewaters from the two specialty bar mills at this plant are discharged to two separate scale pits which in turn discharge to a common scale pit. Wastewaters from this scale pit are pumped to a settling lagoon, then discharged to a receiving stream. No recycle is employed.

Plant A-2 (0112B) - Figure VII-16 (Primary and Section)

The wastewater treatment system for this plant serves a combination of hot forming mills (billet and rail mills). The wastewaters from each of the mills pass through primary scale pits and are then discharged into a secondary clarification device called a settling cone. The settling cone is elevated to allow for gravity flow to the deep bed filters. A portion of the settling cone overflow is recycled to the hot forming mills with the balance going to the deep bed filters. Filter effluent is discharged to a lake. Filter backwash is discharged back into the primary scale pits.

Plant B-2 (0112B) - Figure VII-17 (Primary)

This treatment is identical to that of Plant A-2 except that no recycle is in place.

This treatment facility is a combination system serving both blooming and structural mills, although the structural mill was not operating at the time of sampling. Wastewater passes through primary scale pits and then is discharged to a settling cone. The settling cone is elevated to allow for gravity flow to the deep bed filters. The settling cone effluent is discharged to the deep bed filters and the filter effluent is then discharged to a lake. Filter backwash is discharged back into the primary scale pits.

Plant D-2 (0946A) - Figure VII-18 (Primary and Section)

The wastewater treatment system for Plant D-2 serves several hot forming mills including a blooming mill, two merchant bar mills, and a bar mill. The wastewaters from each of the mills pass through primary scale pits and then discharge to the thickener. The bar mill wastewater, though, is recycled to the process prior to the thickener. Also, one of the merchant bar mills' wastewater bypasses the thickener and combines with the thickener overflow. The thickener underflow is discharged to a blast furnace thickener. The rolling mill's thickener overflow is discharged to a central scale pit equipped with oil collection facilities. The wastewaters are then discharged to deep bed filters. The blast furnace thickener overflow is processed through a cyanide destruction system and then filtered in the same deep bed filtering system. The filter effluent is then pumped to a main plant recycle pumping station where river makeup is added and the wastewaters are then recycled to the hot forming mills. The remaining filter effluent is reused for noncontact blast furnace cooling and then discharged.

Plant E-2 (0196A) - Figure VII-19 (Section and Pipe and Tube)

Rod mill, bar mill, and seamless tube mill wastewaters are treated by this combination system. Wastewaters discharge to a primary settling basin from which they are pumped to a clarifier. Clarifier overflow is then filtered by six high rate sand filters. Filter backwash and clarifier underflow are taken to settling pits and a lagoon which empties into the main reservoir. The filter effluent is recycled to only the rod and bar mills after first passing through a cooling tower. Makeup to the system is provided by a main reservoir which also accepts any blowdown from the system. The reservoir overflow is discharged to a receiving stream.

Plant F-2 (0384A) - Figure VII-20 (Section)

Section mill wastewaters first pass through a series of primary and secondary scale pits which are equipped with oil removal facilities. Scale pit effluent is pumped to clarifiers for quiescent settling. Oil skimming is also practiced at the clarifiers. The clarifier overflow is recycled to the process after first passing through a two-cell cooling tower. Clarifier underflow is dewatered using vacuum filters and the filtrate is returned to the clarifiers. The cold well of the cooling tower provides the point of treatment system blowdown.

Plant G-2 (0640A) - Figure VII-21 (Section)

Wastewaters from the 10" and 12" bar mills first pass through scale pits. Scale pit effluents are pumped to two settling basins equipped with waste ejectors and oil skimmers. Overflow from the settling basins is pumped to three wastewater strainers. Strainer backwash water is conveyed to a dirty water sump which follows the scale pits. Strainer effluent is recycled to the process after first passing through a cooling tower. Makeup water from the river is added to the inlet sump. There is no discharge from this system.

Plant H-2 (0432A) - Figure VII-22 (Section)

Rod mill wastewaters are discharged to a scale pit. The effluent from the scale pit is pumped to five cyclones which discharge to a receiving stream. This system is once-through with no recycle.

Plant I-2 (08560) - Figure VII-23 (Section)

The wastewater treatment system for this plant is a combination system treating both section mill and pickling wastewaters. Rod mill wastewater is first sent to a scale pit. The scale pit effluent is then discharged to a terminal settling lagoon which receives pickling wastewater as well. All process effluent is discharged to a receiving stream.

Plant K-2 (0868B) - Figure VII-24 (Flat)

The wastewater treatment system for this operation serves a carbon steel 160" plate mill. Wastewaters from the 160" plate mill pass through primary scale pits and are discharged into two secondary scale pits. The primary scale pits are baffled and have oil removal and collection facilities. The sludge from the secondary scale pits is discharged to a thickener and the thickener overflow is returned to the secondary scale pits. The effluent from these scale pits is pumped through high rate media filters and then recycled to the plate mill after first passing through a cooling tower. The treatment system blowdown is discharged to a receiving stream.

Plant L-2 (0060) - Figure VII-25 (Primary and Flat)

Primary and flat product rolling mill wastewaters are treated by this combination system. Treatment initially consists of primary scale pits equipped with oil collection facilities. The scale pit overflow is discharged to a mixing tank where lime and ferric sulfate are added. From the mix tank, wastewaters enter flocculator tanks which in turn discharge to flocculating clarifiers. The clarifier overflow is recycled to the mills after passing through a cooling tower where makeup water is added. Some of the recycle flow is blown down and some is also used as makeup water to fume scrubbers at the pickling facilities. Clarifier underflow is dewatered by vacuum filters with the filtrate being returned to the flocculator tanks.

Plant M-2 (0384A) - Figure VII-26 (Flat)

The treatment system for this operation treats wastewaters from an 80" carbon steel combination hot strip and sheet mill. Wastewaters from the primary roughing mill stands and the secondary roughing mill stands are pumped to primary scale pits and then to a mixing tank for lime and ferric sulfate addition. Settling of the wastewater is accomplished in clarifiers where skimmed oils are collected and routed to an oil separator tank. The clarifier effluent is discharged to a receiving stream and the sludge is dewatered by vacuum filters.

Plant N-2 (0396D) - Figure VII-27 (Flat)

The primary scale pit receives wastewaters from the roughing and finishing mill stands of this hot strip mill and then discharges the wastewaters to pressure media filters. Strip cooling and coiler wastewater is also discharged to a primary scale pit but is then recycled after first passing through a cooling tower. A blowdown from the cooling tower is delivered to the filters. Filtered water is recycled to the mill roughing and finishing stands. A clarifier receives the filter backwash. The clarifier overflow is returned to the filter inlet while the clarifier underflow is dewatered by vacuum filters. A blowdown is discharged to a POTW.

Plant GG-2 (0240B) - Figure VII-28 (Pipe and Tube)

This plant is a seamless pipe mill producing specialty steel seamless pipe from reheated billets. This pipe mill practices 100% recycle and utilizes primary sedimentation (scale pits), oil separation (API separators) and sedimentation in a lagoon. Wastewaters are recycled to the pipe mill from the lagoon.

Plant II-2 (0916A) - Figure VII-29 (Pipe and Tube)

This plant is a butt welded pipe mill producing carbon steel pipe from skelp. The butt welded pipe mill mixes noncontact and contact cooling waters and discharges its wastewaters on a once-through basis to a double compartment scale pit which is equipped with oil skimming facilities. The scale pit effluent is then pumped to radial, media type pressure filters. The filtered water is discharged to a final settling lagoon. The filter backwash is discharged to a clarification tank where neutralization is provided along with polymer addition. The clarification tank then discharges back into the scale pits. The filtered effluent is discharged to a receiving stream.

Plant JJ-2 (0728) - Figure VII-30 (Pipe and Tube)

This plant is a butt welded pipe mill producing carbon steel pipe from skelp. The pipe mill mixes pickling rinse wastewaters with primary scale pit effluent and discharges the mixed wastewaters to a settling lagoon. The lagoon overflow is pumped to a storage tank which recycles all of the wastewaters to the butt welded pipe mill. Service makeup water and lime are added to the recycled water. Solids from the scale pit and lagoon are landfilled.

Plant KK-2 (0256G) - Figure VII-31 (Pipe and Tube)

This plant is a butt welded pipe mill producing carbon and low alloy pipe from skelp. This pipe mill provides once-through treatment with primary and secondary scale pits. The primary scale pit has oil skimming facilities and is also equipped for the addition of polymer. The secondary scale pit discharges to a receiving stream.

Plant 081 (0176) - Figures VII-32 and VII-33 (Primary and Section)

The wastewater treatment system for this plant provides treatment for a combination of hot forming mill (primary and section rolling mills), combination acid pickling, salt bath descaling, wire pickling and coating, and continuous alkaline cleaning wastewaters.

The wastewaters from the primary and section rolling mills are discharged to an inclined plate separator after passing through primary scale pits. The overflow from the separator is recycled to the primary and section rolling mills. The blowdown from the separator is discharged to a central wastewater treatment system which also treats the wastewaters described above. Makeup water is added to the inclined plate separator and section mills as required. It should be noted that the effluent analytical data presented in this section's tables represent only the discharge from the separator. These data thus depict hot forming wastewater treatment only.

Plant 082 (0496) - Figure VII-34 (Primary and Flat)

The wastewater treatment system for this plant serves a combination of carbon and specialty steel primary (slab) mills and flat (plate) mills. The mills are designated as the 112"/120", the 140", and the 140"/206" combined. Samples were collected to differentiate between carbon and specialty steel production on the same mills. A 112" primary mill can either roll ingots or slabs to heavy plate which, in turn, is the feed stock to a 120" plate mill which provides a further reduction in plate size. A 140" primary mill can also roll either ingots or slabs into heavy plate which, in turn, is the feed stock for a 206" plate mill.

Wastewaters from the 112" mill and the 120" plate mill pass through primary scale pits and are discharged into a common secondary scale pit. Likewise, wastewaters from the 140" and the 206" plate mills flow to primary scale pits and subsequently to a combined secondary scale pit. Overflows from the secondary scale pits are discharged to three parallel settling basins. The effluent from the settling basins is then delivered to a set of gravity filters. The filtered effluent is discharged to a receiving stream. Filter backwash is delivered to a backwash settling basin which discharges to the three parallel settling basins.

Plant 083 (0860H) - Figure VII-35 (Primary, Section, and Flat)

The wastewater treatment system for Plant 083 is a central facility which serves several hot forming mills and steelmaking facilities (i.e., BOF, electric arc furnace). The hot forming mills include primary, section, and plate rolling mills, (blooming mill, structural mill, plate mill, and rod mill). The blooming mill wastewaters are discharged to a main pump station after passing through primary scale pits equipped with oil removal facilities. The rod mill has its own treatment system and discharges only a blowdown to the central treatment system. Other mill wastewaters discharge to the main pump station. The combined wastewaters undergo treatment in flocculating clarifiers and are then recycled through a cooling tower to the various mills.

A portion of the clarifier effluent is blowndown to a POTW. The clarifier underflow is pumped to a thickener which, in turn, discharges to a sludge decant tank. After decanting, the sludge is hauled away by private contractor. Overflow from the decant tank is returned to the thickener.

Plant 087 (0432A) - Figure VII-36 (Section, Flat, and Pipe and Tube)

This plant employs a central treatment system which serves a merchant mill, butt weld pipe mill, blooming mill, hot scarfer, and a hot strip mill. Wastewaters from the various sources first pass through their individual scale pits, which are equipped with baffles and oil removal equipment, and are then pumped to clarifiers. Coagulant aids are added at the clarifier inlet to assist in settling. The clarifier overflow is discharged to a receiving stream and the underflow is dewatered by vacuum filters. At the time of sampling all of the clarifier overflow was discharged to a receiving stream, although provisions have been made for a future recycle system.

Plant 088 (0684A) - Figures VII-37 and VII-38 (Primary, Section, and Pipe and Tube)

The wastewater treatment system for Plant 088 serves a combination of hot forming mills and steelmaking facilities (i.e., vacuum degassing, electric arc furnace). The hot forming mills include primary, section, and seamless pipe and tube operations (blooming mills, three bar mills, and a rod mill).

The wastewaters from the 32" and 34" bar, blooming, billet, and pipe and tube mills are pumped to a collection sump after passing through primary scale pits equipped with oil collection facilities. The wastewaters are then pumped to deep bed pressure filters. The filter effluent is discharged to a pump station from where all of the wastewaters are recycled to the mills. The steelmaking, vacuum degassing, and other wastewaters are directed to the same pump station for reuse throughout the plant. Filter backwash is conveyed to clarifiers after passing through backwash storage and rapid mix tanks. Other rod mill, bar mill, and seamless tube finishing mill wastewaters are also pumped to the filter backwash clarifiers. The clarifier overflow is conveyed to the recycle pump station for return to the processes. The clarifier underflow is delivered to a thickener for further settling. The thickener underflow is dewatered by vacuum filtration while the thickener effluent is returned to the clarifiers. Makeup river water is added at the recycle pump house.

Wastewaters from the 10" rod and 11" bar mills are discharged to a common scale pit and then to a drag link conveyor. A large portion of the drag link conveyor effluent is recycled to the process after first passing through a retention basin. The rest of the drag link conveyor effluent is pumped to the filter backwash rapid mix tank and clarifiers. The clarifier overflow is recycled to the various mills. Clarifier underflow is conveyed to a thickener and is further dewatered by a vacuum filter. The two systems noted above blow down a small amount of wastewater (0.5%) to the 14" bar mill water system described below.

Separately, wastewaters from the 14" bar mill are first treated by two sets of scale pits (refer to Figure VII-38). One set receives wastewaters from the hot saws, shears, stands, pull rods, and bar rotators and then recycles these wastewaters to the process. The second set of scale pits accepts bar mill stands effluent and skip cooling water. A partial recycle is taken from the scale pits back to the process. The remainder of the scale pit effluent is pumped to a mix tank which then discharges to a clarifier. A large portion of the clarifier effluent is recycled to this bar mill. The remaining clarifier effluent is discharged to a POTW system. The clarifier underflow is discharged to a sludge pond.

Plant 281 (0020B) - Figure VII-39 (Flat)

Wastewaters from specialty steel hot strip, blooming and universal mills are treated in a central treatment system. After first passing through primary scale pits, the wastewaters are sent to a main collection sump which discharges into two clarifiers. The clarifier overflow is pumped to deep bed filters and the filter effluent is discharged to a receiving stream. The filter backwash is returned to the clarifiers.

Plant 282A (0088D) - Figure VII-40 (Primary)

Wastewaters from the blooming mill at this plant are discharged to a primary scale pit from which 99 percent is recycled to the mill. The discharge from the scale pit is treated in a central treatment facility which also treats bar mill wastes and pickle rinse waters.

Plant 282B (0088D) - Figure VII-41 (Section)

Wastewater from the 22" bar mill are first treated in primary and secondary scale pits. Approximately 99 percent of the wastewater is recycled from the secondary scale pit to the 22" bar mill. The remaining wastewater is treated in a central treatment facility with the blooming mill wastes and pickle rinse waters.

Plant 283 (0112) - Figure VII-42 (Primary and Section)

Wastewaters from five mills, (the 18", 32", 42", 48" and combination mills) discharge to a common secondary scale pit after first passing through individual primary scale pits associated with each mill (except the 42" mill). The effluent from the secondary scale pit is pumped to a deep bed filtration system and then discharged to the river.

Plant 284 A & B (0112D) - Figure VII-43 (Flat)

The wastewater treatment system for these mills (an 80" hot strip mill and a 160" plate mill) is a central treatment facility serving integrated steel plant operations.

Wastewaters from the 80" hot strip mill primary and secondary roughing stands pass through a primary scale pit. The effluent from the primary scale pit is recycled to the roughing mill flumes. The roughing mill scale pit also has an overflow to the finishing scale pit. The two scale pits are separated by a concrete wall and are equipped with oil baffles and collectors. The overflow from the finishing scale pit is discharged to the central treatment clarifiers.

The 160" plate mill wastewaters pass through a primary scale pit, which also discharges to the clarifiers. Some of the scale pit effluent is recycled to the plate mill stands for flume flushing. The 160" plate mill also has in-line plate heat treatment facilities in which reheated plates pass through a quenching station. Some of the quench pit overflow is delivered to the central treatment facility via two sump pump stations on either end of the quench pits.

The central treatment clarifier overflow is discharged to two twenty-five million gallon terminal lagoons. About 25 percent of the lagoon effluent is recycled for reuse throughout the plant. The remainder of the treated effluent is discharged to a receiving stream.

Plant 285 A and B (0240A) - Figure VII-44 (Primary and Section)

Wastewaters from the blooming mill and scarfer, and the 21" bar mill, pass through separate primary scale pit systems and then to a central treatment system which receives wastewater from other mill sources. The scale pit system consists of two primary scale pits operating in series which receive wastewater directly from the mill. The effluent from this second pit is pumped, along with other wastewaters, to a series of three lagoons. Twelve percent of the final lagoon effluent is discharged to the river and the remainder is recycled for reuse throughout the plant.

Plant 286A and B (0432C) - Figure VII-45 (Primary and Flat)

The wastewater treatment facility at this plant consists primarily of mix tanks for the addition of a neutralizing lime slurry, three clarifiers operating in parallel and recycle. The treatment system receives wastewaters from the universal slabbing mill, 80" hot strip mill, crop cooling, electric are furnace, basic oxygen furnace, furnace reheat and the finishing mill. The universal slabbing mill discharges wastewater to a scale pit out of which a portion is recycled to the mill. The remainder of the scale pit effluent flows to the mix tanks and clarifiers for further treatment. The 80" hot strip mill has a similar arrangement.

Plant 287 (0584B) - Figure VII-46 (Flat)

Wastewaters from the 80" hot strip mill are treated in a two celled roughing pit followed by several lagoons operating in parallel.

Plant 288A and B (0584F) - Figure VII-47 (Primary and Flat)

Wastewaters from the blooming mill at this plant discharge to a scale pit and then flow to a central hot forming treatment facility. This treatment system consists of settling basins equipped with oil removal facilities followed by filters. The discharge from the filter combines with wastewaters from other operations and then flows to a lagoon. Associated with the filters are a backwash water basin, oil removal facilities and a thickener which concentrates the sludge recovered from the backwash basin.

Wastewater from the 54" hot strip mill also discharges to this central treatment system after first passing through a roughing end and a finishing end scale pit. Some of the effluent from the finishing end scale pit is pumped to a hot well which receives indirect cooling water as well. A portion of the hot well wastewater flows directly to the lagoons. The remainder is discharged to a sluice way and then to the roughing end scale pit. This scale pit discharges to the central treatment system.

Plant 289A and B (0684B) - Figure VII-48 (Primary and Flat)

Wastewaters from the 36" blooming mill discharge to primary and secondary scale pits equipped with oil removal facilities. The discharge from the secondary scale pit is discharged to a river.

The treatment system for the 56" hot strip mill consists of two settling basins operating in parallel, followed by a cooling tower and lagoon. A portion of the effluent from the lagoon is recycled and the remainder is discharged.

Plant 290A and B (0856R) - Figure VII-49 (Primary and Section)

The wastewater (including surface wastewater) from the primary rolling mill at this plant is discharged to three scale pits equipped with oil skimmers. Effluents from the scale pits flow into the river.

The treatment system for the No. 5 bar mill consists of a scale pit followed by a clarifier and a polymer addition step. Recycle is provided after the scale pit to provide water for flume flushing. The flume flush water is then returned to the scale pit. Recycle of the clarifier effluent to the bar mill is also practiced.

Plant 291 (0856B) - Figure VII-50 (Primary)

Slab mill wastewaters, including flume flush and scarfer wastewaters, discharge to a common scale pit and then to a main sump. From the main sump, the wastewater flows to a rapid mix tank where polymer is added and then to a clarifier for settling. A portion of the treated wastewater is recycled from the clarifier to the flume and scarfer. The remainder passes through pressure filters and a cooling tower before recycling to the slab mill. A small blowdown discharges to the river.

Plant 292 (0860B) - Figure VII-51 (Flat)

Wastewater from the 84" hot strip mill discharge to three separate scale pits. Over half the mill effluent flows through the roughing mill scale pit which empties to the river. The remainder of the mill effluent passes to the finishing mill scale pit and another scale pit. A portion of the waste stream which flows to this latter pit is recycled to the mill. The remainder overflows to the finishing mill scale pit. Effluent from the finishing mill scale pit is pumped to a filtration plant and is then discharged to the river. A thickener treats the backwash from the filtration plant.

Plant 293 A, B, and C (0865N) - Figure VII-52 (Primary, Section and Pipe and Tube)

Wastewaters from a primary rolling mill, bar mills, and seamless tube mills are treated in a central lagoon system. Each of the mills first discharges to a scale pit before the wastewater proceeds to the central treatment lagoon. Approximately half of the primary mill scale pit effluent is recycled to the sluicing operation.

Plant 294 A and B (0920N) - Figure VII-53 (Primary and Flat)

Wastewaters from a blooming mill and a hot strip mill are treated by two separate treatment systems at this plant. The 44" blooming mill wastes pass through primary scale pits and a secondary scale pit. Over 90 percent is recycled to the mill and the remainder is filtered prior to discharge. The 80" hot strip mill uses three scale pits to treat its wastewaters. One pit is a recirculant pit which returns most of the wastewater it receives to the mill for further use. Approximately 25 percent is discharged as a blowdown. The effluent from the scale pit designated as pit no. 2 is filtered prior to discharge. Wastewater from scale pit no. 1 is discharged directly.

Plant 295 (0942A) - Figure VII-54 (Pipe and Tube)

Wastewaters from the No. 1 and No. 2 seamless mills at this plant discharge to a primary scale pit which empties to the river.

Impact of Intake Water Quality

Where the mass loading of a limited pollutant in the make-up water to a process is small in relation to the raw waste loading of these pollutants, the impact of make-up water quality on wastewater treatment system performance is not significant, and, in many cases, is not measurable. In these instances, the Agency has determined that the respective effluent limitations and standards should be developed and applied on a gross basis.

Tables VII-12 through VII-15 presents the results of the Agency's analysis of the impact of make-up water quality on hot forming raw wastewaters. The data demonstrate that the impact of make-up water quality is not significant. Accordingly, the Agency developed the limitations and standards on a gross basis and has determined they should be applied on a gross basis. However, the Agency is aware that plants located on inland streams take in high loadings of river silt and sediment during periods of high surface water runoff. Some of this river silt and sediment can pass through properly designed and operated treatment systems. The Agency believes that allowances for these situations should be made in accordance with 40 CFR 122.63(h). The Agency does not believe that the occurrence of such conditions can or should be used as a reason to defer or cancel the installation of the model wastewater treatment facilities, or equivalent, necessary to achieve the applicable limitations and standards.

TABLE VII-1

OPERATING MODES, CONTROL AND TREATMENT TECHNOLOGIES AND DISPOSAL METHODS

Symbols

A. Operating Modes

1. OT Once-Through

2. Rt,s,n Recycle, where t = type waste
s = stream recycled
n = % recycled

t: U = Untreated
T = Treated

	s	n
P	Process Wastewater	% of raw waste flow
F	Flume Only	% of raw waste flow
S	Flume and Sprays	% of raw waste flow
FC	Final Cooler	% of FC flow
BC	Barometric Cond.	% of BC flow
VS	Abs. Vent Scrub.	% of VS flow
FH	Fume Hood Scrub.	% of FH flow

3. REt,n Reuse, where t = type
n = % of raw waste flow

t: U = before treatment
T = after treatment

4. BDn Blowdown, where n = discharge as % of raw waste flow

B. Control Technology

10. DI Deionization

11. SR Spray/Fog Rinse

12. CC Countercurrent Rinse

13. DR Drag-out Recovery

C. Disposal Methods

20. H Haul Off-Site

21. DW Deep Well Injection

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT TECHNOLOGIES AND DISPOSAL METHODS
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C. Disposal Methods (cont.)

22.	Qt,d	Coke Quenching, where t = type d = discharge as % of makeup t: DW = Dirty Water CW = Clean Water
23.	EME	Evaporation, Multiple Effect
24.	ES	Evaporation on Slag
25.	EVC	Evaporation, Vapor Compression Distillation

D. Treatment Technology

30.	SC	Segregated Collection
31.	E	Equalization/Blending
32.	Scr	Screening
33.	OB	Oil Collecting Baffle
34.	SS	Surface Skimming (oil, etc.)
35.	PSP	Primary Scale Pit
36.	SSP	Secondary Scale Pit
37.	EB	Emulsion Breaking
38.	A	Acidification
39.	AO	Air Oxidation
40.	GF	Gas Flotation
41.	M	Mixing
42.	Nt	Neutralization, where t = type t: L = Lime C = Caustic A = Acid W = Wastes O = Other, footnote

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT
TECHNOLOGIES AND DISPOSAL METHODS
PAGE 3

D. Treatment Technology (cont.)

43.	FLt	Flocculation, where t = type t: L = Lime A = Alum P = Polymer M = Magnetic O = Other, footnote
44.	CY	Cyclone/Centrifuge/Classifier
44a.	DT	Drag Tank
45.	CL	Clarifier
46.	T	Thickener
47.	TP	Tube/Plate Settler
48.	SLn	Settling Lagoon, where n = days of retention time
49.	BL	Bottom Liner
50.	VF	Vacuum Filtration (of e.g., CL, T> or TP underflows)
51.	Ft,m,h	Filtration, where t = type m = media h = head

t	m	h
D = Deep Bed	S = Sand	G = Gravity
F = Flat Bed	O = Other, footnote	P = Pressure

52.	CLt	Chlorination, where t = type t: A = Alkaline B = Breakpoint
53.	CO	Chemical Oxidation (other than CLA or CLB)

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT
TECHNOLOGIES AND DISPOSAL METHODS
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D. Treatment Technology (cont.)

54.	BOt	Biological Oxidation, where t = type t: An = Activated Sludge n = No. of Stages T = Trickling Filter B = Biodisc O = Other, footnote
55.	CR	Chemical Reduction (e.g., chromium)
56.	DP	Dephenolizer
57.	ASt	Ammonia Stripping, where t = type t: F = Free L = Lime C = Caustic
58.	APt	Ammonia Product, where t = type t: S = Sulfate N = Nitric Acid A = Annydrous P = Phosphate H = Hydroxide O = Other, footnote
59.	DSt	Desulfurization, where t = type t: Q = Qualifying N = Nonqualifying
60.	CT	Cooling Tower
61.	AR	Acid Regeneration
62.	AU	Acid Recovery and Reuse
63.	ACt	Activated Carbon, where t = type t: P = Powdered G = Granular
64.	IX	Ion Exchange
65.	RO	Reverse Osmosis
66.	D	Distillation

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT
TECHNOLOGIES AND DISPOSAL METHODS
PAGE 5

D. **Treatment Technology (cont.)**

67.	AA1	Activated Alumina
68.	OZ	Ozonation
69.	UV	Ultraviolet Radiation
70.	CNTt,n	Central Treatment, where t = type n = process flow as % of total flow t: 1 = Same Subcats. 2 = Similar Subcats. 3 = Synergistic Subcats. 4 = Cooling Water 5 = Incompatible Subcats.
71.	On	Other, where n = Footnote number
72.	SB	Settling Basin
73.	AE	Aeration
74.	PS	Precipitation with Sulfide

TABLE VII-2

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: PRIMARY WO/SCARFING

Raw Wastewaters														
Reference Code:	0020B		0256K$^{(1)}$0		684D 0176		0860H		0684B					
Plant Code:	E		K		Q		081		083		289A			
Sampling Points:	6		12		4$^{(2)}$		B		E		-$^{(1)}$		Average	
Flow (gal/ton):	2740		5600		3420		760		320		1050		2320	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	110	1.26	NA	-	48	0.68	21	0.067	244	0.33	NA	-	106	0.58
Oil and Grease	28	0.32	NA	-	12.8	0.18	165	0.52	35	0.047	NA	-	60	0.27
pH (units)	7.0 - 7.5		NA		7.0 - 7.6		7.9 - 8.1		7.0 - 7.1		NA		7.0 - 8.1	
Chromium	*	0.00	NA	-	0.54	0.0077	0.13	0.00041	0.12	0.00016	NA	-	0.20	0.00021
Copper	*	0.00	NA	-	*	0.00	0.97	0.0031	0.53	0.00071	NA	-	0.38	0.00095
Lead	ND	ND	NA	-	ND	ND	0.81	0.0026	0.04	0.000053	NA	-	0.21	0.00066
Nickel	0.19	0.0022	NA	-	0.17	0.0024	0.55	0.0017	0.09	0.00012	NA	-	0.25	0.0016
Zinc	0.04	0.00046	NA	-	0.08	0.0011	0.14	0.00044	0.1	0.00013	NA	-	0.09	0.00053

Effluents												
Reference Code:	0020B		0256K		0684D		0176		0860H		0684B	
Plant Code:	E		K		Q		081		083		289A	
Sampling Points:	$(\frac{8}{7+8})5$		12		5$^{(2)}$		E		$(\frac{E}{Q})$ B		B	
Flow (gal/ton):	2740		800		3420		51		12		1050	
C&TT	PSP,CL,FP,OT		PSP,SS,RUP 85.7		PSP,SS,OT		PSP,TP,RTP 93		PSP,CL,CT,RTP 96		PSP,SSP,SS,OT	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	13.0	0.16	NA	-	29	0.41	18	0.0038	9	0.00039	31	0.136
Oil and Grease	2.0	0.017	NA	-	4.0	0.057	10	0.0021	10	0.00076	NA	-
pH (units)	5.8 - 6.6		NA		7.2 - 7.6		7.8 - 8.1		7.1 - 7.6		7.5 - 8.0	
Chromium	*	0.00	NA	-	*	0.00	0.08	0.000020	0.13	0.0000011	0.004	0.000018
Copper	*	0.00	NA	-	0.02	0.00028	0.76	0.00016	0.04	0.0000056	0.036	0.000158
Lead	ND	ND	NA	-	ND	ND	0.32	0.00007	<0.05	**	0.17	0.000744
Nickel	*	0.00	NA	-	0.63	0.0090	0.48	0.00010	<0.02	<0.0000015	ND	ND
Zinc	0.03	0.00034	NA	-	0.07	0.0010	0.10	0.00002	0.07	**	0.31	0.00136

---

(1) Data not available

(2) Sample includes wastewater from hot forming operations other than primary. Data is therefore not included in the average.

* :	Concentration is <0.010 mg/l
**:	Less than 0.0000005 lbs/1000 lbs
NA:	Not Available or Not Analyzed
ND:	Not Detected
- :	Insufficient data

TABLE VII-3

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: PRIMARY W/SCARFING

Raw Wastewaters														
Reference Code:	0248B		0248A		0432J		0112B(01&02)		0112B(03)		0946A		0060	
Plant Code:	D		H		H$^{(2)}$		A-2		B-2		D-2		L-2	
Sampling Points:	9		7+8$^{(1)}$		-		4		3		1+2		1$^{(2)}$	
Flow (gal/ton):	535		2480		4490		890		510		700		610	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	100	0.22	158	1.63	-	-	100	-	61	0.13	49	0.14	16	-
Oil and Grease	52	0.12	1.7	0.018	-	-	17	-	150	0.32	19	0.055	12	-
pH (units)	6.4		5.8 - 6.2		-		7.6		8.0 - 8.3		7.8 - 8.2		7.6 - 8.1	
Chromium	NA	-	ND	ND	-	-	NA	-	NA	-	NA	-	NA	-
Copper	NA	-	0.01	0.00010	-	-	NA	-	NA	-	NA	-	NA	-
Lead	NA	-	ND	ND	-	-	NA	-	NA	-	NA	-	NA	-
Nickel	NA	-	ND	ND	-	-	NA	-	NA	-	NA	-	NA	-
Zinc	NA	-	0.03	0.00031	-	-	NA	-	NA	-	NA	-	NA	-

Effluents														
Reference Code:	0248B		0248A		0432J		0112B(01&02)		0112B(03)		0946A		0060	
Plant Code:	D		H		H$^{(2)}$		A-2		B-2		D-2		L-2	
Sampling Points:	9		9$^{(3)}$		7		2$^{(2)}$		2		$(\frac{1+2}{1+2+4+5})6$		2$^{(2)}$	
Flow (gal/ton):	535		2479		110		520		510		210		10.3	
C&TT	PSP,SS,OT		PSP,OT		PSP,SSP,RUP 98		PSP,Settling Cone, FP,RTP 41.6		PSP, Settling Cone, FP,OT		PSP,T,FD,RTP 30, RET 70		PSP,FLL, FLP,CL, CT,RTP98.3 RET 1.1	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	100	0.22	-	-	35	-	1.6	-	3.0	0.0064	23	0.27	4.9	-
Oil and Grease	52	0.12	-	-	27	-	1.7	-	2.2	0.0047	8.3	0.046	7.9	-
pH (units)	6.4		-		5.8 - 6.3		7.6 - 8.0		7.7 - 7.8		8.0 - 8.2		8.6 - 8.7	
Chromium	NA	-	-	-	0.24	-	NA	-	NA	-	NA	-	NA	-
Copper	NA	-	-	-	0.04	-	NA	-	NA	-	NA	-	NA	-
Lead	NA	-	-	-	NA	-	NA	-	NA	-	NA	-	NA	-
Nickel	NA	-	-	-	0.15	-	NA	-	NA	-	NA	-	NA	-
Zinc	NA	-	-	-	0.02	-	NA	-	NA	-	NA	-	NA	-

TABLE VII-3
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: PRIMARY W/SCARFING
PAGE 2

Raw Wastewaters												
Reference Code:	0496		0496		0684H$^{(5)}$		0088D		0240A$^{(6)}$		0432C	
Plant Code:	082(140")		082(140",206")		088		282A		285A		286A	
Sampling Points:	$\frac{G_1 + H_1}{2} - A$		$\frac{H_2 + J_2}{2} - A$		B + C		B		B		C	
Flow (gal/ton):	170		460		1700		5050		2320		2190	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	81	0.057	62	0.12	24	0.17	NA	-	54	0.53	NA	-
Oil and Grease	63	0.045	3.5	0.0067	6.0	0.043	NA	-	NA	-	NA	-
pH (units)	7.7 - 8.9		7.7 - 8.9		7.9		NA		7.9 - 8.1		NA	
Chromium	0.04	0.000028	0.06	0.00012	0.02	0.00014	1.5	0.032	0.16	0.0016	0.094	0.00086
Copper	0.14	0.000099	0.2	0.00038	0.21	0.0015	2.4	0.051	0.26	0.0025	0.26	0.0024
Lead	0.4	0.00028	0.12	0.0023	0.3	0.0021	0.088	0.0019	0.29	0.0028	0.12	0.0011
Nickel	0.51	0.00036	0.32	0.00061	0.12	0.00085	1.1	0.023	0.44	0.0043	0.065	0.00059
Zinc	0.04	0.000028	0.055	0.00011	0.05	0.00035	0.4	0.0084	0.15	0.0015	5.6	0.051
Effluents												
Reference Code:	0496		0496		0684H		0088D		0240A		0432C	
Plant Code:	082(140")		082(140",206")		088		282A		285A		286A	
Sampling Points:	$\frac{O_1 + P_1}{2} - A$		P_2		(B+C/H)P		C		D		$\left(\frac{C}{C+D+E+H+I+J+A}\right)K$	
Flow (gal/ton):	170		460		5		25		266		301	
C&TT	PSP,SSP,Settling Basin, FG,OT		PSP,SSP,Settling Basin, FG,OT		PSP,FP,RTP 99.7		PSP,SSP,RUP 99.5		PSP,SSP,SS,SL, RTP 88.5		PSP,SS,FLL,FLP,NW, CL,VF,CT,RUP 47.7, RTP 38.6	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	1	0.00071	1	0.0019	2	0.000038	85	0.00886	13	0.014	NA	-
Oil and Grease	12	0.0085	9	0.017	4	0.00018	NA	-	NA	-	NA	-
pH (units)	7.4 - 7.5		7.4		7.6 - 7.8		NA		7.8 - 8.0		NA	
Chromium	ND	ND	0.04	0.00008	ND	ND	0.27	0.000028	0.012	0.000013	0.005	0.000006
Copper	0.04	0.00003	0.04	0.00008	ND	ND	0.46	0.000048	0.043	0.000048	0.031	0.000039
Lead	ND	ND	ND	ND	ND	ND	0.007	0.000001	0.14	0.00016	ND	ND
Nickel	0.05	0.00004	ND	ND	0.01	**	0.19	0.000020	0.073	0.000081	0.007	0.000009
Zinc	0.03	0.00002	ND	ND	0.01	**	0.12	0.000012	0.16	0.00018	0.56	0.00070

TABLE VII-3
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: PRIMARY W/SCARFING
PAGE 3

Raw Wastewaters												
Reference Code:	0584F		0856R		0856B		0856N		0920N			
Plant Code:	288A		290A		291		293A		294A			
Sampling Points:	B		B		A		B		C		Average	
Flow (gal/ton):	820		6400		2340		2250		4310		2300	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	62	0.21	55	1.47	160	1.56	68	0.64	94	1.69	71	0.66
Oil and Grease	NA	-	NA	NA	NA	-	NA	-	NA	-	42	0.087
pH (units)	NA		7.5 - 7.7		7.0 - 7.3		NA		7.1		5.8 - 8.9	
Chromium	ND	ND	0.027	0.00072	ND	ND	0.032	0.00030	ND	ND	0.16	0.0030
Copper	0.072	0.00025	0.04	0.0011	0.13	0.0013	0.041	0.00038	0.13	0.0023	0.32	0.0053
Lead	0.011	0.000038	ND	ND	0.30	0.0029	0.12	0.0011	ND	ND	0.15	0.0010
Nickel	ND	ND	ND	ND	0.11	0.0011	0.079	0.00074	ND	ND	0.23	0.0027
Zinc	0.17	0.00058	0.065	0.0017	0.06	0.00059	0.074	0.00069	0.072	0.0013	0.56	0.0055

Effluents										
Reference Code:	0584F		0856R		0856B		0856N		0920N	
Plant Code:	288A		290A		291		293A		294A	
Sampling Points:	$(\frac{B}{B+C+D})E$		B		C-D		$E^{(2)}$		E	
Flow (gal/ton):	820		6400		24		1040		510	
C&TT	PSP,SSP,SS,FG T,OT		PSP,SS,OT		PSP,CL,FP,CT,		PSP,SS,SL,RUP 53.8		PSP,SSP,FP,RTP 88	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	2.6	0.0089	55	1.47	8.5	0.00085	13	0.056	7.0	0.015
Oil and Grease	NA	-	NA	-	NA	-	NA	-	NA	-
pH (units)	7.3 - 7.4		7.5 - 7.7		7.3 - 7.4		NA		7.1	
Chromium	ND	ND	0.027	0.00072	ND	ND	0.001	0.000004	ND	ND
Copper	ND	ND	0.04	0.0011	ND	ND	0.008	0.000035	ND	ND
Lead	ND	ND	ND	ND	ND	ND	0.009	0.000039	ND	ND
Nickel	ND	ND	ND	ND	0.045	0.000004	0.035	0.00015	ND	ND
Zinc	0.046	0.00016	0.065	0.0017	0.018	0.000002	0.15	0.00065	0.03	0.000064

TABLE VII-3
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: PRIMARY W/SCARFING
PAGE 4

(1) Represents mill effluent rather than primary scale pit effluent.
(2) Includes wastewaters from iron and steel operations other than primary. Data therefore, is not included in the average.
(3) Sample contains non contact cooling water and thus is not a representative sample of the contact water process.
(4) The lbs/1000 lbs value cannot be derived directly from the concentrations and flow rate shown. See the Section VII text for further explanation.
(5) Visited earlier as Plant C-2, which is not shown here.
(6) Visited earlier as Plant R, which is not shown here

NA: Not Available
ND: Not Detectable
- : Insufficient data
**: Less than 0.0000005 lbs/1000 lbs

TABLE VII-4

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: SECTION - CARBON

Raw Wastewaters												
Reference Code:	0112B		0291C		0291C		0291C		0196A		0196A	
Plant Code:	A-2		D-2(No. 5 Bar)		D-2(No. 2 Bar)		D-2(No. 6 Bar)		E-2 (Rod)		E-2(Bar)	
Sampling Points:	$4^{(1)}$		5		4		3		2		3	
Flow (gal/ton):	600		9560		9740		8400		8820		3170	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	100	-	37	1.48	50	2.03	45	1.58	73	2.68	34	0.45
Oil and Grease	17	-	20	0.80	17	0.69	18	0.63	21	0.77	4.5	0.06
pH (units)		7.6		8.0 - 8.1		8.0 - 8.1		8.0 - 8.1		8.2 - 8.3		8.2 - 8.3
Chromium	NA	-	NA	-	NA	-	NA	-	NA	-	NA	-
Copper	NA	-	NA	-	NA	-	NA	-	NA	-	NA	-
Lead	NA	-	NA	-	NA	-	NA	-	NA	-	NA	-
Nickel	NA	-	NA	-	NA	-	NA	-	NA	-	NA	-
Zinc	NA	-	NA	-	NA	-	NA	-	NA	-	NA	-

Effluents												
Reference Code:	0112B		0291C		0291C		0291C		0196A		0196A	
Plant Code:	A-2		D-2(No. 5 Bar)		D-2(No. 2 Bar)		D-2(No. 6 Bar)		E-2(Rod)		E-2(Bar)	
Sampling Points:	$2^{(1)}$		6+7		6+7		(3)		$(\frac{2}{1+2+3})4$		$(\frac{3}{1+2+3})4$	
Flow (gal/ton):	350		8040		8190		0		3150		1130	
C&TT	PSP, Settling Cone, FP, RTP 41.6		PSP, T, SSP, SS, FP, RTP 15.9		PSP, SSP, SS, FP, RTP 15.9		PSP, RUP 100		PSP, CL, FS, CT, RTP 64.3		PSP, CL, FS, CT, RTP 64.4	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	1.6	-	23	0.38	23	0.39	-	0.0	4.9	0.090	4.9	0.030
Oil and Grease	1.7	-	8.3	0.15	8.3	0.16	-	0.0	10.5	0.35	10.5	0.027
pH (units)		7.5 - 8.0		8.0 - 8.2		8.0 - 8.2		-		8.3		8.3
Chromium	NA	-	NA	-	NA	-	NA	0.0	NA	-	NA	-
Copper	NA	-	NA	-	NA	-	NA	0.0	NA	-	NA	-
Lead	NA	-	NA	-	NA	-	NA	0.0	NA	-	NA	-
Nickel	NA	-	NA	-	NA	-	NA	0.0	NA	-	NA	-
Zinc	NA	-	NA	-	NA	-	NA	0.0	NA	-	NA	-

TABLE VII-4
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: SECTION - CARBON
PAGE 2

Raw Wastewaters										
Reference Code:	0384A(06)		0640A(01,02)		0432A(04)		0860H(02)		0860H(03)	
Plant Code:	F-2		G-2		H-2		083(34")		083(Rod)	
Sampling Points:	2		1		3		G		K	
Flow (gal/ton):	1910		14,020		6590		4720		6930	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	41	0.33	68	3.98	96	2.64	35	0.69	259	7.48
Oil and Grease	5.9	0.047	2.7	0.16	19	0.52	47	0.93	38	1.10
pH (units)	7.7		7.4 - 8.0		6.6 - 6.8		6.9		7.3 - 7.5	
Chromium	NA	-	NA	-	NA	-	0.11	0.022	0.04	0.0013
Copper	NA	-	NA	-	NA	-	0.09	0.018	0.14	0.0040
Lead	NA	-	NA	-	NA	-	<0.05	<0.00098	ND	ND
Nickel	NA	-	NA	-	NA	-	<0.02	<0.00039	0.07	0.0020
Zinc	NA	-	NA	-	NA	-	0.08	0.0016	0.08	0.0023

Effluents										
Reference Code:	0384A(06)		0640A(01,02)		0432A(04)		0860H(02)		0860H(03)	
Plant Code:	F-2		G-2		H-2		083(34")		083 Rod	
Sampling Points:	3		2		2		(G/Q)B		R	
Flow (gal/ton):	140		0		6590		180		90	
	C&TTPSP,SSP,SS,CL, FLL,FLP,NW,VF, CT,RTP 92		PSP,SS,SL,FD,CT, RTP 100		PSP,CY,OT		PSP,CL,CT,T,RTP 96		PSP,CL,RTP 99	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	29	0.017	47	0.00	71	1.95	9	0.00082	62	0.023
Oil and Grease	8.3	0.0048	2.3	0.00	17.8	0.49	10	0.015	30	0.011
pH (units)	7.8 - 8.5		7.4 - 8.1		6.8 - 7.0		7.1 - 7.6		7.4	
Chromium	NA	-	NA	0.00	NA	-	0.13	0.000015	<0.03	<0.000011
Copper	NA	-	NA	0.00	NA	-	0.04	0.000016	0.07	0.000026
Lead	NA	-	NA	0.00	NA	-	<0.05	<0.0000032	<0.05	<0.000019
Nickel	NA	-	NA	0.00	NA	-	<0.02	<0.0000049	<0.02	<0.0000075
Zinc	NA	-	NA	0.00	NA	-	0.07	0.000021	0.06	0.000023

TABLE VII-4
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: SECTION - CARBON
PAGE 3

Raw Wastewaters										
Reference Code:	0112		0856R		0856N		0684H(06,07)		0684H(02)	
Plant Code:	283		290B		293B		088(10"/11")		088(34")	
Sampling Points:	B		C		C		T		F	
Flow (gal/ton):	1850		950		2980		3400		580	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	NA	-	15	0.059	59	0.73	52	0.74	24	0.058
Oil and Grease	NA	-	NA	-	NA	-	33	0.47	4	0.097
pH (units)	NA		8.6 - 8.7		NA		7.3 - 7.7		7.6 - 7.9	
Chromium	0.006	0.000046	0.027	0.00011	0.018	0.00022	ND	ND	ND	ND
Copper	0.078	0.00060	0.23	0.00091	0.012	0.00015	0.07	0.00099	0.08	0.00019
Lead	0.035	0.00027	0.067	0.00027	0.004	0.000050	ND	ND	ND	ND
Nickel	0.033	0.00025	0.040	0.00016	0.050	0.00062	0.09	0.0013	0.08	0.00019
Zinc	0.30	0.0023	0.018	0.000071	0.11	0.0014	0.78	0.011	0.06	0.00015

Effluents										
Reference Code:	0112		0856R		0856N		0684H(06,07)		0684H(02)	
Plant Code:	283		290B		293B		088(10"/11")		088(34")	
Sampling Points:	C(1)		D		E(1)		S		(F/M)P	
Flow (gal/ton):	1850		190		2980		10.2		1.7	
C&TT	PSP,SSP,SS,		PSP,SS,FLP,CL, RTP&RUP 79.8,FP(4)		PSP,SS,SL,OT		PSP,SSP,SB,CL,T, VF,FLP,RTP 99.7		PSP,FD,CL,T,VF, RTP 99.7	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs(2)
Suspended Solids	85	0.66	7.7	0.0061	13	0.16	19	0.00081	2	0.000012
Oil and Grease	NA	-	NA	-	NA	-	16	0.00068	4	0.000033
pH (units)	NA		8.9 - 9.1		NA		8.5 - 9.5		7.6 - 7.8	
Chromium	0.27	0.0021	ND	ND	0.001	0.000012	ND	ND	ND	ND
Copper	0.46	0.0035	0.15	0.00012	0.008	0.00010	ND	ND	ND	ND
Lead	0.007	0.000054	0.017	0.000014	0.009	0.00011	ND	ND	ND	ND
Nickel	0.19	0.0015	ND	ND	0.035	0.00044	0.02	**	0.01	**
Zinc	0.12	0.00093	0.012	0.000010	0.15	0.0019	0.05	**	0.01	**

TABLE VII-4
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: SECTION - CARBON
PAGE 4

Raw Wastewaters								
Reference Code:	0684H(01)		0684H(03)		0684H(05)			
Plant Code:	088(36")		088(32")		088(14")			
Sampling Points:	D+E		G		X+Z		Average	
Flow (gal/ton):	4710		950		3510		5160	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	22	0.43	30	0.12	47	0.69	58	1.54
Oil and Grease	2	0.039	12	0.048	25	0.37	18	0.45
pH (units)	7.9 - 8.0		7.7 - 7.9		7.0 - 7.4		6.6 - 8.7	
Chromium	ND	ND	ND	ND	0.009	0.00013	0.021	0.0024
Copper	0.13	0.0026	0.08	0.00032	0.08	0.0012	0.099	0.0029
Lead	ND	ND	ND	ND	0.06	0.00088	0.017	0.00015
Nickel	0.05	0.00098	0.06	0.00024	0.016	0.0023	0.063	0.00080
Zinc	0.04	0.00079	0.06	0.00024	0.99	0.014	0.25	0.0034

Effluents						
Reference Code:	0684H(01)		0684H(03)		0684H(05)	
Plant Code:	088(36")		088(32")		088(14")	
Sampling Points:	(D+E/M)P		(G/M)P		AC	
Flow (gal/ton):	14		2.8		10	
C&TT	PSP,FD,CL,T,VF, RTP 99.7		PSP,FD,CL,T,VF, RTP 99.7		PSP,CT,CL,RUP 44, RTP 55.7	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	2	0.000090	2	0.000025	87	0.0036
Oil and Grease	4	0.00016	4	0.00018	15	0.000011
pH (units)	7.6 - 7.8		7.6 - 7.8		7.5	
Chromium	ND	ND	ND	ND	0.12	0.000005
Copper	ND	ND	ND	ND	0.27	0.000011
Lead	ND	ND	ND	ND	0.09	0.000004
Nickel	0.01	**	0.01	**	0.47	0.000020
Zinc	0.01	**	0.01	**	2.2	0.000092

TABLE VII-4
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: SECTION - CARBON
PAGE 5

(1) Contains wastewater from iron and steel operations other than section. Data therefore is not included in the average.
(2) The lbs/1000 lbs value cannot be derived directly from the concentrations and flowrate shown. See the Section VII text for further explanation.
(3) No sample of the scale pit effluent could be obtained.
(4) This component was not on stream during the sampling program.

- : Insufficient data
NA: Not Available
ND: Not Detected
**: Less than 0.0000005 lbs/1000 lbs

TABLE VII-5

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: SECTION - SPECIALTY

Raw Wastewaters										
Reference Code:	0424(01-03)		0248 A&B		0256K		0432J		08560	
Plant Code:	C		H		K		M		I-2	
Sampling Points:	$8^{(1)}$		13		10		6		2	
Flow (gal/ton):	5260		4210		1470		670		5010	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	3.3	0.072	54	0.95	93	0.57	54	0.15	170	3.55
Oil and Grease	1.9	0.042	9.2	0.16	4.7	0.029	9.9	0.028	7.4	0.15
pH (units)	7.0		6.0 - 6.3		7.2 - 7.5		6.3 - 6.5		7.6 - 7.7	
Chromium	*	0.00	*	0.00	*	0.00	0.07	0.00020	NA	-
Copper	*	0.00	*	0.00	0.05	0.00031	0.04	0.00011	NA	-
Lead	ND	ND	ND	ND	ND	ND	NA	NA	NA	-
Nickel	0.14	0.0031	*	0.00	0.82	.0050	0.11	0.00031	NA	-
Zinc	0.02	0.00044	0.02	0.00035	0.02	0.00012	0.012	0.000034	NA	-

Effluents										
Reference Code:	0424(01-03)		0248 A&B		0256K		0432J		08560	
Plant Code:	C		H		K		M		I-2	
Sampling Points:	$(\frac{8}{6+7+8})^{1}$		13		10		$7^{(3)}$		$(\frac{2}{2+4})5^{(3)}$	
Flow (gal/ton):	910		4210		1470		99		5010	
C&TT	Cooling Reservoir, RET 82.7		PSP,OT		PSP,OT		PSP,SSP,RUP 85.2		PSP,SL,OT	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	45	0.0038	54	0.95	93	0.57	35	-	39	-
Oil and Grease	6.1	0.045	9.2	0.16	4.7	0.029	27	-	14	-
pH (units)	6.1 - 6.2		6.0 - 6.3		7.2 - 7.5		5.8 - 6.3		6.7	
Chromium	0.04	0.00	*	0.00	*	0.00	0.24	-	NA	-
Copper	0.02	0.00	*	0.00	0.05	0.00031	0.04	-	NA	-
Lead	ND	ND	ND	ND	ND	ND	NA	-	NA	-
Nickel	0.03	0.000025	*	0.00	0.82	0.0050	0.15	-	NA	-
Zinc	0.02	0.000038	0.02	0.00035	0.02	0.00012	0.02	-	NA	-

TABLE VII-5
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: SECTION - SPECIALTY
PAGE 2

Raw Wastewaters										
Reference Code:	0176(01-03)		0432A(02)		0088D		0240A			
Plant Code:	081		087(14"Mill)		282B		285B		Average	
Sampling Points:	C		D		B		C			
Flow (gal/ton):	3570		6340		6450		2600		3950	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	14	0.21	62	1.64	NA	-	30	0.33	60	0.93
Oil and Grease	12	0.18	4	0.11	NA	-	NA	-	7.0	0.10
pH (units)	7.8 - 8.1		7.1 - 7.4		NA		8.0 - 8.1		6.0 - 8.1	
Chromium	0.02	0.00030	ND	ND	0.12	0.0032	0.046	0.00050	0.0036	0.00053
Copper	0.60	0.0089	0.03	0.00079	0.085	0.0023	0.068	0.00074	0.11	0.0016
Lead	0.22	0.0033	0.49	0.013	ND	ND	0.13	0.0014	0.12	0.0025
Nickel	0.50	0.0074	ND	ND	0.088	0.0024	0.26	0.0028	0.24	0.0026
Zinc	0.04	0.00060	0.14	0.0037	0.036	0.00097	0.13	0.0014	0.052	0.00095

Effluents								
Reference Code:	0176(01-03)		0432A(02)		0088D		0240A	
Plant Code:	081		087(14"Mill)		282B		285B	
Sampling Points:	(B/B+C)E		$(\frac{D}{D+C+E})F$		C		D	
Flow (gal/ton):	250		6340		48		300	
C&TT	SSP,SS,TP, RTP 93		CT,CL,FLL,VF,SS, FLM,OT		PSP,SSP,SS, RUP 99.3		PSP,SSP,SS,SL, RTP 88.5	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	18	0.014	38	1.05	85	0.017	13	0.016
Oil and Grease	10	0.0024	4	0.079	NA	-	NA	-
pH (units)	7.8 - 8.1		7.4 - 7.6		NA		7.8 - 8.0	
Chromium	0.080	0.000048	0.014	0.00037	0.27	0.000054	0.012	0.000015
Copper	0.76	0.00064	0.004	0.00011	0.46	0.000092	0.043	0.000053
Lead	0.32	0.00020	ND	ND	0.007	0.000001	0.14	0.00017
Nickel	0.48	0.00047	ND	ND	0.19	0.000038	0.073	0.000091
Zinc	0.10	0.000062	0.12	0.0032	0.12	0.000024	0.16	0.00020

TABLE VII-5
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: SECTION - SPECIALTY
PAGE 3

(1) Represents mill effluent rather than a primary scale pit effluent. Data is not included in the average.
(2) The lbs/1000 lbs values cannot be directly derived from the flow rate and concentrations shown.
Refer to Section VII text for further explanation.
(3) Insufficient data to allow calculation of a proportioned lbs/1000 lbs.

- : Insufficient data
* : Less than 0.010 mg/l
NA: Not Available
ND: Not Detected

TABLE VII-6

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: FLAT - HOT STRIP AND SHEET

Raw Wastewaters										
Reference Code:	0248B		0176		0060		0384A		0396D	
Plant Code:	D		O		L-2		M-2		M-2	
Sampling Points:	6-9		11(1)		1		2+3		6	
Flow (gal/ton):	3310		12,800		4520		8440		7270	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	4.9	0.68	35	1.87	16	0.30	25	0.88	54	1.64
Oil and Grease	14	0.19	0.7	0.037	12	0.23	6.4	0.23	31	0.94
pH (units)	6.3		7.6 - 8.1		7.6 - 8.1		8.4		7.3 - 7.5	
Chromium	NA	-	0.003	0.00016	NA	-	NA	-	NA	-
Copper	NA	-	0.01	0.00053	NA	-	NA	-	NA	-
Lead	NA	-	ND	ND	NA	-	NA	-	NA	-
Nickel	NA	-	0.32	0.017	NA	-	NA	-	NA	-
Zinc	NA	-	0.02	0.0011	NA	-	NA	-	NA	-

Effluents										
Reference Code:	0248B		0176		0060		0384		A0396D	
Plant Code:	D		O		L-2		M-2		M-2	
Sampling Points:	6-9		11		2		4		7	
Flow (gal/ton):	3310		12,800		76		8,440		0	
C&TT	OT		PSP, RUP 98		PSP,FLL,FLO1,CL, VF,CT,RTP 97, RET 1		PSP,CL,VF,OT		PSP,CT,VF,CL, FS,RTP 100	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	49	0.68	35	1.87	5	0.0016	16	0.56	39	0.00
Oil and Grease	14	0.19	0.7	0.037	7.9	0.0025	6.9	0.24	61	0.00
pH (units)	6.3		7.6 - 8.1		8.6 - 8.7		8.4 - 8.5		7.4 - 7.7	
Chromium	NA	-	0.003	0.00016	NA	-	NA	-	NA	0.00
Copper	NA	-	0.01	0.00053	NA	-	NA	-	NA	0.00
Lead	NA	-	ND	ND	NA	-	NA	-	NA	0.00
Nickel	NA	-	0.32	0.017	NA	-	NA	-	NA	0.00
Zinc	NA	-	0.02	0.0011	NA	-	NA	-	NA	0.00

TABLE VII-6
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: FLAT - HOT STRIP AND SHEET
PAGE 2

Raw Wastewaters										
Reference Code:	0432A		$0020B^{(2)}$		0112D(02)		0432C		0584B	
Plant Code:	087		281		284A		286B		287	
Sampling Points:	C		B		B		D+E		B	
Flow (gal/ton):	4670		5690		6110		3500		4150	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	74	1.44	112	2.66	63	1.61	NA	-	48	0.83
Oil and Grease	6	0.12	NA	-	NA	-	NA	-	NA	NA
pH (units)	7.4 - 7.6		6.7 - 7.1		NA		NA		NA	
Chromium	0.01	0.00019	0.6	0.014	0.004	0.00010	0.60	0.0080	0.044	0.00076
Copper	0.031	0.00060	0.083	0.0020	0.025	0.00064	0.042	0.00061	0.17	0.00029
Lead	0.33	0.0064	ND	ND	ND	ND	0.020	0.00029	ND	ND
Nickel	ND	ND	0.61	0.014	ND	ND	0.30	0.0044	ND	ND
Zinc	0.034	0.00066	0.080	0.0019	0.026	0.00066	0.18	0.0026	0.26	0.00045

Effluents										
Reference Code:	0432A		0020B		0112D		0432C		0584B	
Plant Code:	087		281		284A		286B		287	
Sampling Points:	$(\frac{C}{C+D+E})F$		$C^{(4)}$		$D^{(4)}$		$(\frac{D+E}{C+D+E+H+I+J+A})K$		C	
Flow (gal/ton):	4670		5690		2470		380		4150	
C&TT	FLP,FLM,CL,SS, SCR,VF,OT		PSP,CL,FP,OT		PSP,FLP,SL, RUP 46.2, RTP 13.4		PSP,SS,FLL,FLP,NW, CL,VF,CT,RUP 13.0, RTP 76.1		PSP,SS,SL,SS,OT	
	mg/l	lbs/1000 lbs(3)	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	38	0.73	4.7	0.11	1.7	0.018	NA	-	18	0.31
Oil and Grease	4	0.088	NA	-	NA	-	NA	-	NA	-
pH (units)	7.4 - 7.6		7.[illegible] - 7.5		NA		NA		NA	
Chromium	0.014	0.00019	ND	ND	0.004	0.000041	0.069	0.00011	0.007	0.00012
Copper	0.004	0.000075	ND	ND	0.004	0.000041	0.011	0.000017	0.008	0.00014
Lead	ND	ND	ND	ND	0.017	0.00018	ND	ND	ND	ND
Nickel	ND	ND	ND	ND	ND	ND	0.070	0.00011	ND	ND
Zinc	0.12	0.0014	0.008	0.0019	0.035	0.00036	0.038	0.000060	0.012	0.00021

TABLE VII-6
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: FLAT - HOT STRIP AND SHEET
PAGE 3

Raw Wastewaters										
Reference Code:	0584F		0684B		0860B(5)		0920N			
Plant Code:	288B		289B		292		294B			
Sampling Points:	C+D		D		B+C		F+G+I		Average	
Flow (gal/ton):	3160		6660		3280		8200(7)		5300	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	64	0.84	56	1.56	40	0.55	62	2.1	55	1.26
Oil and Grease	NA	NA	NA	-	NA	-	NA	-	14	0.34
pH (units)	NA		7.3 - 7.9		NA		7.3		6.3 - 8.4	
Chromium	0.006	0.000079	0.005	0.00014	0.005	0.000068	ND	ND	0.14	0.0027
Copper	0.022	0.00029	0.024	0.00067	0.007	0.000096	0.013	0.00044	0.029	0.00063
Lead	ND	ND	0.039	0.0011	ND	ND	ND	ND	0.043	0.00087
Nickel	ND	ND	ND	ND	ND	ND	ND	ND	0.10	0.0020
Zinc	0.16	0.0021	0.13	0.0036	0.024	0.00033	0.060	0.0021	0.080	0.0016

Effluents								
Reference Code:	0584F		0684B		0860B		0920N	
Plant Code:	288B		289B		292		294B	
Sampling Points:	$(\frac{C+D}{B+C+D})E$		E		B+D(6)		F+H+I(6)	
Flow (gal/ton):	3160		890		3280		4860(7)	
C&TT	PSP, SSP, SS, FG, T, OT		PSP, SS, CT, SL, RUP 39.0, RTP 47.6		PSP, SS, SSP, T, VF, FP		PSP, FP, RTP 10.1, RUP 30.6	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	2.7	0.036	32	0.12	1.7	0.20	5	0.42
Oil and Grease	NA	-	NA	-	NA	-	NA	-
pH (units)	7.3 - 7.4		7.5 - 7.8		NA		7.1	
Chromium	ND	ND	ND	ND	ND	0.000027	ND	ND
Copper	ND	ND	0.021	0.000078	ND	0.000041	ND	ND
Lead	ND	ND	0.033	0.00012	ND	ND	ND	ND
Nickel	ND	ND	0.017	0.000063	ND	ND	ND	ND
Zinc	0.043	0.00057	0.10	0.00037	0.012	0.00027	0.050	0.0011

TABLE VII-6
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: FLAT - HOT STRIP AND SHEET
PAGE 4

(1) Sample includes wastewater from hot forming operations other than hot strip and sheet. Data is therefore not included in the average.
(2) Visited earlier as Plant E which is not shown here.
(3) The lbs/1000 lbs values cannot be directly derived from the flowrate and concentrations shown. Refer to Section VII text for further explanation.
(4) Contains wastewater from iron and steel operations other than flat.
(5) Visited earlier as Plant J-2 which is not shown here.
(6) The effluent discharge is a combination of treated and untreated wastewater. The effluent quality presented here reflects the treated portion, but effluent loads represent the total discharge.
(7) The gallons per ton flow is based on 1976 tonnage.

- : Insufficient data
NA: Not Available
ND: Not Detected

TABLE VII-7

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: FLAT - PLATE, CARBON

Raw Wastewaters								
Reference Code:	0868B		0496(01)		0496(03&04)		0496(02)	
Plant Code:	K-2		082(140")		082(112/120")		082(140"/206")	
Sampling Points:	1		H-A		D-A		J_2-A	
Flow (gal/ton):	3690		120		870		210	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	61	0.94	65	0.033	22	0.080	48	0.042
Oil and Grease	11	0.17	34	0.017	8	0.029	4	0.0035
pH (units)		6.9 - 7.2	7.7 - 8.9		7.2		7.4	
Chromium	NA	-	0.04	0.000020	0.0	0.00	0.04	0.000035
Copper	NA	-	0.15	0.000075	0.18	0.00065	0.31	0.00027
Lead	NA	-	0.26	0.00013	0.04	0.00015	0.05	0.000044
Nickel	NA	-	0.33	0.00017	0.11	0.00040	0.12	0.00011
Zinc	NA	-	0.03	0.000015	0.05	0.00018	0.06	0.000053

Effluents								
Reference Code:	0868B		0496(01)		0496(03&04)		0496(02)	
Plant Code:	K-2		082(140")		082(112"/120")		082(140"/206")	
Sampling Points:	2		$(\frac{H}{H+D+J_1})$ (P-A)		$(\frac{D}{D+H+J_1})$ (P-A)		$(\frac{J_2}{J_2+H+D})$ (P-A)	
Flow (gal/ton):	100		120		870		210	
C&TT:	PSP,SSP,T, Filter,CT,RTP 97.3		PSP,SSP,DR,FG,OT		PSP,SSP,DR,FG,OT		PSP,SSP,DR,FG,OT	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	5.3	0.0022	1	0.000088	1	0.0064	1	0.0021
Oil and Grease	6.3	0.0026	10	0.0088	10	0.064	10	0.018
pH (units)		7.0 - 7.3	7.4		7.4		7.4	
Chromium	NA	-	0.02	0.000056	0.02	0.00	0.02	0.000061
Copper	NA	-	0.04	0.000016	0.04	0.00012	0.04	0.000028
Lead	NA	-	ND	ND	ND	ND	ND	ND
Nickel	NA	-	0.03	0.000016	0.03	0.000034	0.03	0.000004
Zinc	NA	-	0.02	0.00	0.02	0.00	0.02	0.000004

TABLE VII-7
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: FLAT - PLATE, CARBON
PAGE 2

Raw Wastewaters						
Reference Code:	0860H(01)		0112D(01)			
Plant Code:	083		284B			
Sampling Points:	I		C		Average	
Flow (gal/ton):	9820		8830		3920	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	20	0.82	43	1.58	43	0.58
Oil and Grease	20	0.82	NA	-	15	0.21
pH (units)	7.2 - 7.3		NA		6.9 - 8.9	
Chromium	0.12	0.0049	0.014	0.00051	0.043	0.0011
Copper	0.10	0.0041	0.032	0.0012	0.15	0.0013
Lead	ND	ND	ND	ND	0.070	0.000065
Nickel	0.02	0.00082	ND	ND	0.12	0.00030
Zinc	0.11	0.0045	0.022	0.00081	0.054	0.0011

Effluents				
Reference Code:	0860H(01)		0112D	
Plant Code:	083		284B	
Sampling Points:	$(\frac{I}{Q})$ B		$D^{(3)}$	
Flow (gal/ton):	360		2600	
C&TT:	PSP,CL,CT, RTP 96.3		PSP,FLP,SL, RUP 60.8,RTP 14.7	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	9	0.00011	1.7	0.018
Oil and Grease	10	0.0014	NA	-
pH (units)	7.1 - 7.6		NA	
Chromium	0.13	0.000035	0.004	0.000043
Copper	0.04	0.000032	0.004	0.000043
Lead	<0.05	<0.0000066	0.017	0.00018
Nickel	<0.02	<0.0000077	ND	ND
Zinc	0.07	0.000006	0.035	0.00038

TABLE VII-7
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: FLAT - PLATE, CARBON
PAGE 3

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(1) The lbs/1000 lbs values cannot be derived directly from the flowrate and concentrations shown. Refer to the Section VII text for further explanation.
(2) This plant was visited earlier as Plant 086 which is not shown here.
(3) The sample contains wastewater from iron and steel operations other than flat.

- : Insufficient data
ND: Not Detected
NA: Not Available

TABLE VII-8
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: FLAT - PLATE, SPECIALTY

Raw Wastewaters								
Reference Code:	0856H		0496(01)		0496(03&04)			
Plant Code:	F		082(140")		082(112/120")			
Sampling Points:	8		G-A		C-A		Average	
Flow (gal/ton):	4290		140		2650		2360	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	75	1.34	110	0.064	31	0.34	72	0.58
Oil and Grease	32	0.57	60	0.035	6	0.066	33	0.22
pH (units)	6.6 - 6.7		7.8		7.5		6.6 - 7.8	
Chromium	ND	ND	0.07	0.000041	0.12	0.0013	0.063	0.00045
Copper	ND	ND	0.18	0.00011	0.15	0.0017	0.11	0.00060
Lead	214	3.83	0.47	0.00027	ND	ND	71	1.28
Nickel	0.04	0.00072	0.94	0.00055	0.28	0.0031	0.42	0.0015
Zinc	0.03	0.00054	0.05	0.000029	0.04	0.00044	0.04	0.00034

Effluents						
Reference Code:	0856H		0496(01)		0496(03&04)	
Plant Code:	F		082(140")		082(112"/120")	
Sampling Points:	8		$(\frac{G}{G+C+J})_1$ (O-A)		$(\frac{C}{C+G+H})$ (O-A)	
Flow (gal/ton):	4290		140		2650	
C&TT	PSP,OT		PSP,SSP,DR,FG,OT		PSP,SSP,DR,FG,OT	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs(1)	mg/l	lbs/1000 lbs
Suspended Solids	75	1.34	1	0.0085	1	0.018
Oil and Grease	32	0.57	13	0.076	13	0.23
pH (units)	6.6 - 6.7		7.5		7.5	
Chromium	ND	ND	ND	ND	ND	ND
Copper	ND	ND	0.05	**	0.05	**
Lead	214	3.83	ND	ND	ND	ND
Nickel	0.04	0.00072	0.04	0.000013	0.04	0.00018
Zinc	0.03	0.00054	ND	ND	ND	ND

---

(1) The lbs/1000 lbs value cannot be derived directly from the flowrate and concentration shown. Refer to Section VII text for further explanation.

ND: Not Detected
**; Less than 0.0000005 lbs/1000 lbs.

TABLE VII-9

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS HOT FORMING: PIPE AND TUBE

Raw Wastewaters								
Reference Code:	0196A		0240B		0916A		0728	
Plant Code:	E-2		GG-2		II-2		JJ-2	
Sampling Points:	1		1		1-5		2	
Flow (gal/ton):	12,800		1,700		2760		2290	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs(1)	mg/l	lbs/1000 lbs
Suspended Solids	39	2.08	44	0.31	202	2.97	120	1.15
Oil and Grease	20	1.07	8.3	0.059	4.3	0.066	12	0.11
pH (units)	8.2		7.0 - 7.8		7.0		6.8 - 6.9	
Chromium	NA	-	NA	-	NA	-	NA	NA
Copper	NA	-	NA	-	NA	-	NA	NA
Lead	NA	-	NA	-	NA	-	NA	NA
Nickel	NA	-	NA	-	NA	-	NA	NA
Zinc	NA	-	NA	-	NA	-	NA	NA
Effluents								
Reference Code:	0196A		0240B		0916A		0728	
Plant Code:	E-2		GG-2		II-2		JJ-2	
Sampling Points:	(1/1+2+3)5		1		(1-5/1) 4		1	
Flow (gal/ton):	4570		0		2760		0	
C&TT:	PSP, SS, SSP, SS, SL, CL, FP, CT, RTP 64		PSP, Oil Separator, SL, RUP 100		PSP, SS, FP, SL, OT		PSP, SL, RTP & RET 100	
	mg/l	lbs/1000 lbs(1)	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	10	0.14	44	0.00	34	0.50	20	0.00
Oil and Grease	9.8	0.22	8.3	0.00	2.0	0.026	4.5	0.00
pH (units)	8.3		7.0 - 7.8		7.7		7.1 - 7.4	
Chromium	NA	-	NA	0.00	NA	-	NA	0.00
Copper	NA	-	NA	0.00	NA	-	NA	0.00
Lead	NA	-	NA	0.00	NA	-	NA	0.00
Nickel	NA	-	NA	0.00	NA	-	NA	0.00
Zinc	NA	-	NA	0.00	NA	-	NA	0.00

TABLE VII-9
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
HOT FORMING: PIPE & TUBE
PAGE 2

Raw Wastewaters												
Reference Code:	0256G		0432A		0684H		0856N		0948A			
Plant Code:	KK-2		087		088		293C		295			
Sampling Points:	I		E		I+J+K+L		D		C		Average	
Flow (gal/ton):	520		8080		7010		2140		5620		4770	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	120	0.26	66	2.22	34	0.99	19	0.17	82	1.96	81	1.35
Oil and Grease	6.7	0.015	5	0.17	7.9	0.23	NA	-	NA	-	9.2	0.25
pH (units)	6.8 - 7.1		7.1 - 7.4		7.2 - 7.8		NA		7.3 - 7.5		6.8 - 8.2	
Chromium	NA	NA	ND	ND	0.0	0.00	0.002	0.000018	0.046	0.0011	0.012	0.00028
Copper	NA	NA	0.045	0.0015	0.071	0.0021	0.01	0.000090	0.13	0.0031	0.064	0.0017
Lead	NA	NA	0.5	0.017	0.028	0.00082	0.008	0.000072	0.11	0.0026	0.16	0.0051
Nickel	NA	NA	0.26	0.0088	0.08	0.0023	0.036	0.00032	0.022	0.00053	0.10	0.0030
Zinc	NA	NA	ND	ND	0.057	0.0017	0.12	0.0011	0.36	0.0086	0.13	0.0029

Effluents										
Reference Code:	0256G		0432A		0684H		0856N		0948A	
Plant Code:	KK-2		087		088		293C		295	
Sampling Points:	2		$(\frac{E}{E/E+C+D})F$		(I+J+K+L/M) P		$E^{(2)}$		C	
Flow (gal/ton):	520		8080		21		2140		5620	
C&TT:	PSP,SS,SSP,OT,		CNT,FLP,FLM,CL, SS,SCR,VF,OT		FP,VF,FLL,FLP,CT, CL,T,RTP 99.7		PSP,SS,SL,OT		PSP,SS,CT	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs(1)	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	116	0.25	38	1.42	2	0.00021	13	0.12	82	1.96
Oil and Grease	7	0.015	4	0.13	4	0.00087	NA	-	NA	-
pH (units)	6.8 - 7.4		7.4 - 7.6		7.6 - 7.8		NA		7.3 - 7.5	
Chromium	NA	-	0.014	0.00	ND	ND	0.001	0.000009	0.046	0.0011
Copper	NA	-	0.004	0.000022	ND	ND	0.008	0.000072	0.13	0.0030
Lead	NA	-	-	-	ND	ND	0.009	0.000081	0.11	0.0026
Nickel	NA	-	-	-	0.01	Neg.	0.035	0.00031	0.022	0.00052
Zinc	NA	-	0.123	0.00	0.01	Neg.	0.15	0.0013	0.36	0.0084

---

(1) The lbs/1000 lbs values cannot be derived directly from the flowrate and concentrations shown. Refer to Section VII text for further explanation.

(2) The sample contains wastewater from hot forming operations other than pipe and tube.

NA: Not Available
ND: Not Detected
- : Insufficient data

TABLE VII-10

SUMMARY OF LONG-TERM DATA
HOT FORMING SUBCATEGORY

Plant Code	Total Suspended Solids (mg/l) No. of Observations	Average	Maximum	Standard Deviation	Oil and Grease (mg/l) No. of Observations	Average	Maximum	Standard Deviation	Principle Treatment Component
0112B	87	10.6	24.4	3.9	87	1.1	3.8	0.6	Filtration
0112C-011	580	8.9	44.0	7.0	690	6.7	47.1	6.5	Filtration
0112C-122	496	13.3	63.4	12.4	684	2.0	20.3	2.2	Filtration
0112C-334	415	2.3	23.5	3.0	727	1.3	12.2	1.4	Filtration
0112C-617	399	4.8	33.8	5.5	647	1.3	7.9	1.3	Filtration
0684H	40	6.0	21.0	5.5	27	3.4	20.0	4.0	Filtration
0684F	78	22.2	60.0	13.7	79	9.6	27.0	4.3	Filtration, Lagoon
0320	151	15.8	39.0	7.4	35	0.1	0.3	0.06	Lagoons
0584A	101	25.4	55.0	9.1	98	5.9	20.6	4.3	Settling Basin
0584B	98	24.6	50.0	8.6	58	8.4	29.0	4.2	Lagoons
0856N	101	32.1	114.0	21.6	103	7.0	20.3	2.7	Settling Basin

Note: Additional details on long-term data analysis are provided in Volume I.

TABLE VII-11

D-DCP SCALE AND OILS GENERATION DATA
HOT FORMING SUBCATEGORY

Subcategory	Plant Code	Suspended Solids		Oils and Greases
		Pounds of Scale Per Ton of Production	% of Production	Gallons of oils Per Ton of Production
Primary	0868A	50-75	2.5-3.75	0.14
	0320	47	2.35	NA
	0864A	47	2.35	0.126
	0432J	23	1.15	0.15
	0920A	42	2.1	0.0025(2)
	0460A	36	1.8	0.010(2)
	0440A	41	2.05	Negligible
	0112B	NA	NA	NA
Section	0068B	60	3.0	NA
	0136B	40	2.0	NA
	0088A	30	1.5	NA
	0136B	NA	NA	NA
	0672B	50	2.5	0(2)
	0672B	50	2.5	0(2)
	0684H	26	1.3	NA
	0860H	20	1.0	0.45
	0612	36	1.8	Unknown
Flat	0060	20	1.0	NA
	0176	NA	NA	NA
	0432C	23	1.15	0.01(2)
	0448A	46	2.3	0.22
	0448A	NA	NA	-
	0684B	12(1)	0.6(1)	NA
	0684F	16.8(1)	0.84(1)	Unknown
	0684V	2(1)	0.05(1)	NA
	0920N	32	1.6	NA
Pipe & Tube	0240B	40	2.0	0.05(2)
	0652A	50	2.6	0.01(2)
	0728	82	4.1	NA
AVERAGE		41.1(1)	2.05%(1) Say: 2.1%	0.23(2)

Summary:

Suspended Solids

Mills without scarfers: 2.1%, 42 lbs/ton
Mills with scarfers : 4.2%, 84 lbs/ton

Oils and Greases

Based on oils with densities 85% that of water
0.23 gal/ton, 1.6 lb/ton

---

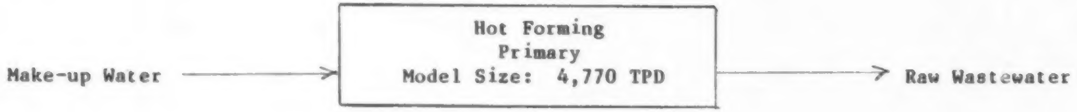
(1) The data from those mills reporting a solids generation rate less than 1% (less than 20 lb/ton) were not included in the average as these values were considered to be atypically low.

(2) The oil generation values less than 0.1 gal/ton were not included in the average as these values were considered to be atypically low.

NA: Not Available.

TABLE VII-12

NET CONCENTRATION AND LOAD ANALYSIS
HOT FORMING - PRIMARY OPERATION


Make-up Water
Hot Forming
Primary
Model Size: 4,770 TPD
Raw Wastewater

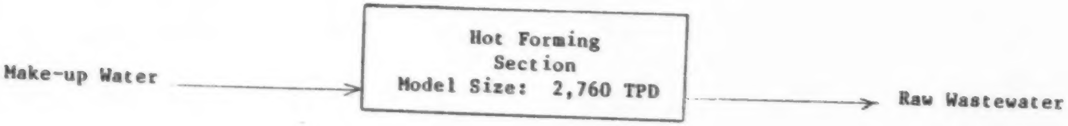
1,090 GPT x 4,770 TPD = 5.2 MGD

2,780 GPT x 4,770 TPD = 13.3 MGD

	Make-up				Raw Waste		Make-up as a
	Conc. (mg/l)			Avg. Load	Avg. Conc.	Avg. Load	% of
Regulated Pollutants	Min.	Max.	Avg.	(lbs/day)	(mg/l)	(lbs/day)	Raw Waste Load
Oil & Grease	3.0	15	10	433.7	67	7,431.8	5.84
Total Suspended Solids	2.0	346	49	2,125	2,550	282,851	0.75
119 Chromium	<0.005	0.080	0.007	0.30	2.0	221.8	0.35
122 Lead	<0.005	0.17	0.029	1.26	5.6	621.2	0.21
128 Zinc	<0.020	0.68	0.16	6.94	3.3	366.0	1.90

TABLE VII-13

NET CONCENTRATION AND LOAD ANALYSIS
HOT FORMING - SECTION OPERATIONS


Make-up Water
Hot Forming
Section
Model Size: 2,760 TPD
Raw Wastewater

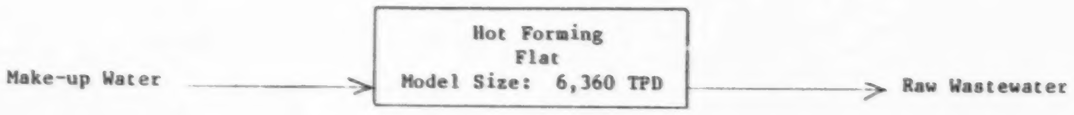
2,150 GPT x 2,760 TPD = 5.9 MGD

4,600 GPT x 2,760 TPD = 12.7 MGD

Regulated Pollutants	Make-up				Raw Waste		Make-up as a % of Raw Waste Load
	Conc. (mg/l)			Avg. Load (lbs/day)	Avg. Conc. (mg/l)	Avg. Load (lbs/day)	
	Min.	Max.	Avg.				
Oil & Grease	2.0	15	5.0	246.01	44	4,660	5.28
Total Suspended Solids	3.0	69	36	1,771	1,150	121,806	1.45
119 Chromium	<0.006	0.028	0.018	0.89	0.51	54.02	1.65
122 Lead	<0.005	1.0	0.070	3.44	3.2	338.9	1.01
128 Zinc	<0.020	0.37	0.14	6.89	4.4	466.0	1.48

TABLE VII-14

NET CONCENTRATION AND LOAD ANALYSIS
HOT FORMING - FLAT OPERATIONS


Make-up Water
Hot Forming
Flat
Model Size: 6,360 TPD
Raw Wastewater

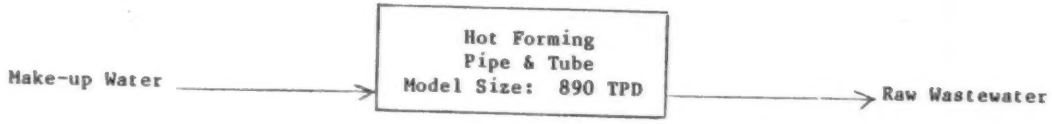
2,180 GPT x 6,360 TPD = 13.9 MGD

5,320 GPT x 6,360 TPD = 33.8 MGD

Regulated Pollutants	Make-up Conc. (mg/l) Min.	Make-up Conc. (mg/l) Max.	Make-up Conc. (mg/l) Avg.	Make-up Avg. Load (lbs/day)	Raw Waste Avg. Conc. (mg/l)	Raw Waste Avg. Load (lbs/day)	Make-up as a % of Raw Waste Load
Oil & Grease	2.0	15	7	811.48	45	12,685	6.40
Total Suspended Solids	1.0	346	25	2,898	1,180	332,633	0.87
119 Chromium	<0.010	0.280	0.012	1.39	1.8	507.4	0.27
122 Lead	<0.030	1.0	0.033	3.83	1.8	507.4	0.75
128 Zinc	0.005	0.37	0.095	11.01	1.4	394.7	2.79

TABLE VII-15

NET CONCENTRATION AND LOAD ANALYSIS
HOT FORMING - PIPE & TUBE OPERATIONS


Make-up Water
Hot Forming
Pipe & Tube
Model Size: 890 TPD
Raw Wastewater

1,270 GPT x 890 TPD = 1.1 MGD

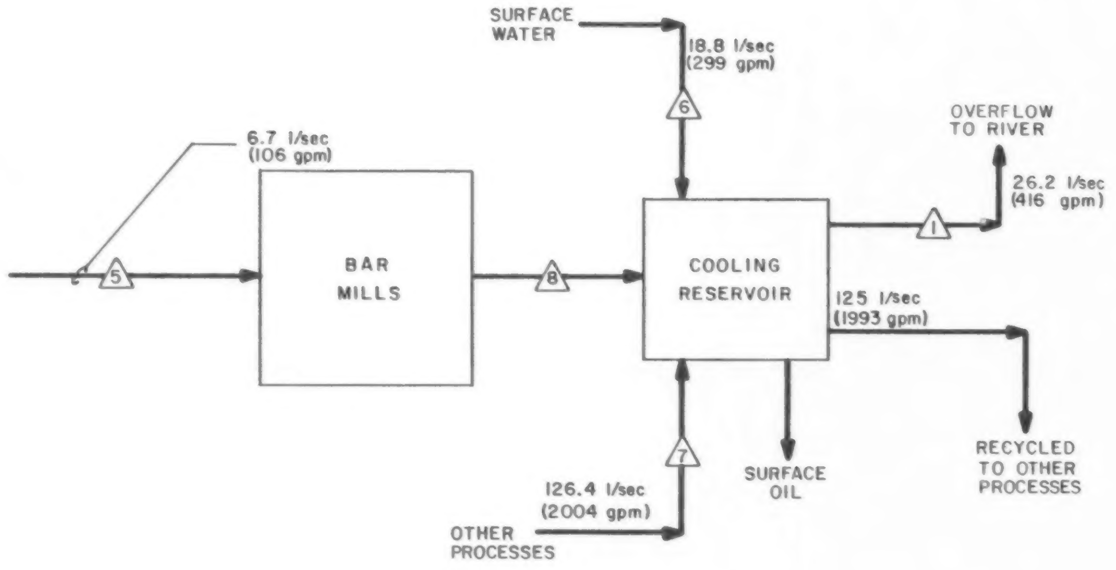
5,520 GPT x 890 TPD = 4.9 MGD

Regulated Pollutants	Make-up Conc. (mg/l) Min.	Make-up Conc. (mg/l) Max.	Make-up Conc. (mg/l) Avg.	Make-up Avg. Load (lbs/day)	Raw Waste Avg. Conc. (mg/l)	Raw Waste Avg. Load (lbs/day)	Make-up as a % of Raw Waste Load
Oil & Grease	2.0	5.0	3.0	27.52	35	1,430	1.92
Total Suspended Solids	12	69	39	357.8	910	37,188	0.96
119 Chromium	<0.010	0.28	0.049	0.45	0.20	8.17	5.51
122 Lead	<0.046	1.00	0.19	1.74	2.1	85.82	2.03
128 Zinc	<0.106	0.57	0.33	3.03	1.7	69.47	4.36

PROCESS: HOT FORMING (BAR MILL)

PLANT: C

PRODUCTION: 26.3 metric tons steel/day
(29 tons steel/day)


SURFACE WATER
18.8 l/sec (299 gpm)
6
6.7 l/sec (106 gpm)
5
BAR MILLS
8
COOLING RESERVOIR
OVERFLOW TO RIVER
26.2 l/sec (416 gpm)
1
125 l/sec (1993 gpm)
7
126.4 l/sec (2004 gpm)
OTHER PROCESSES
SURFACE OIL
RECYCLED TO OTHER PROCESSES

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT FORMING (SECTION)
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

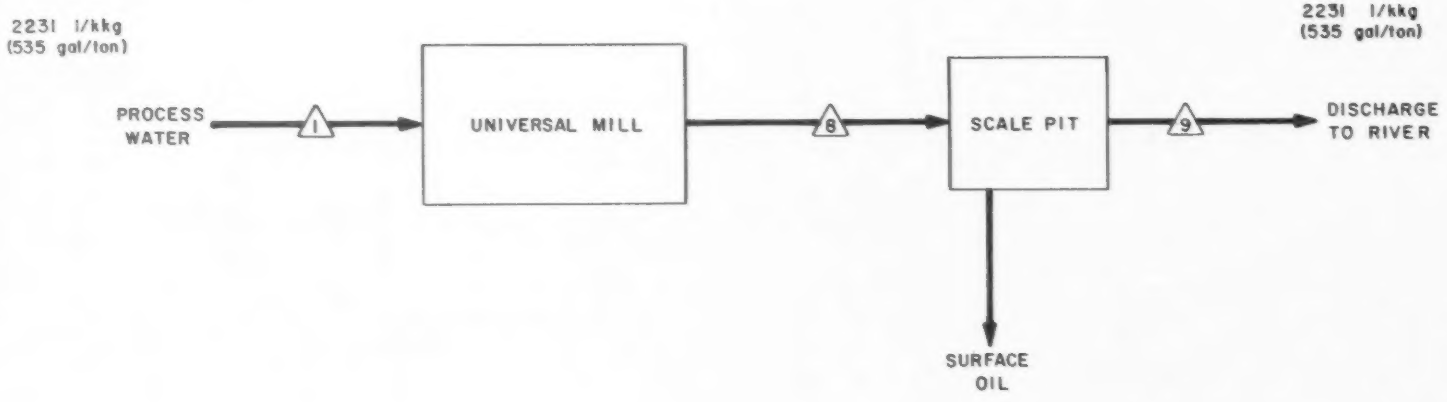
Dwn. 3/6/79

FIGURE VII-1

PROCESS: Hot Forming - Universal Mill

PLANT: D

PRODUCTION:


2231 l/kkg
(535 gal/ton)
PROCESS WATER
1
UNIVERSAL MILL
8
SCALE PIT
9
2231 l/kkg
(535 gal/ton)
DISCHARGE TO RIVER
SURFACE OIL

△ SAMPLING POINTS

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING - PRIMARY
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

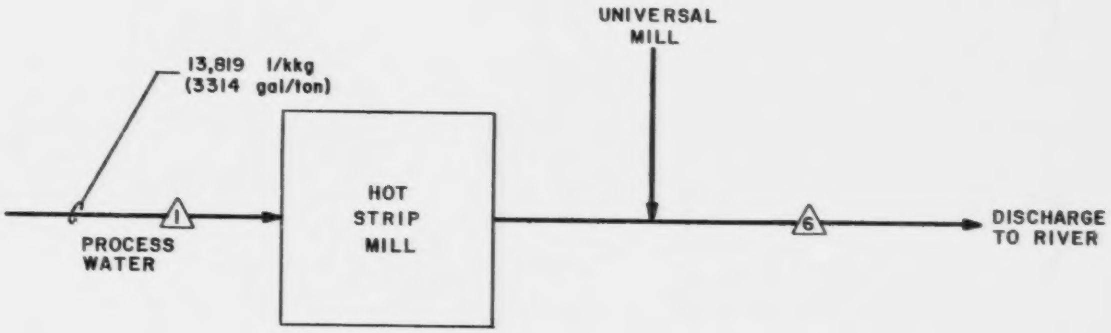
Dwn. 3/2/79

FIGURE VII-2

PROCESS: HOT FORMING (HOT STRIP)

PLANT: D

PRODUCTION:


13,819 l/kkg
(3314 gal/ton)
PROCESS WATER
1
HOT STRIP MILL
UNIVERSAL MILL
6
DISCHARGE TO RIVER

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING (FLAT)
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

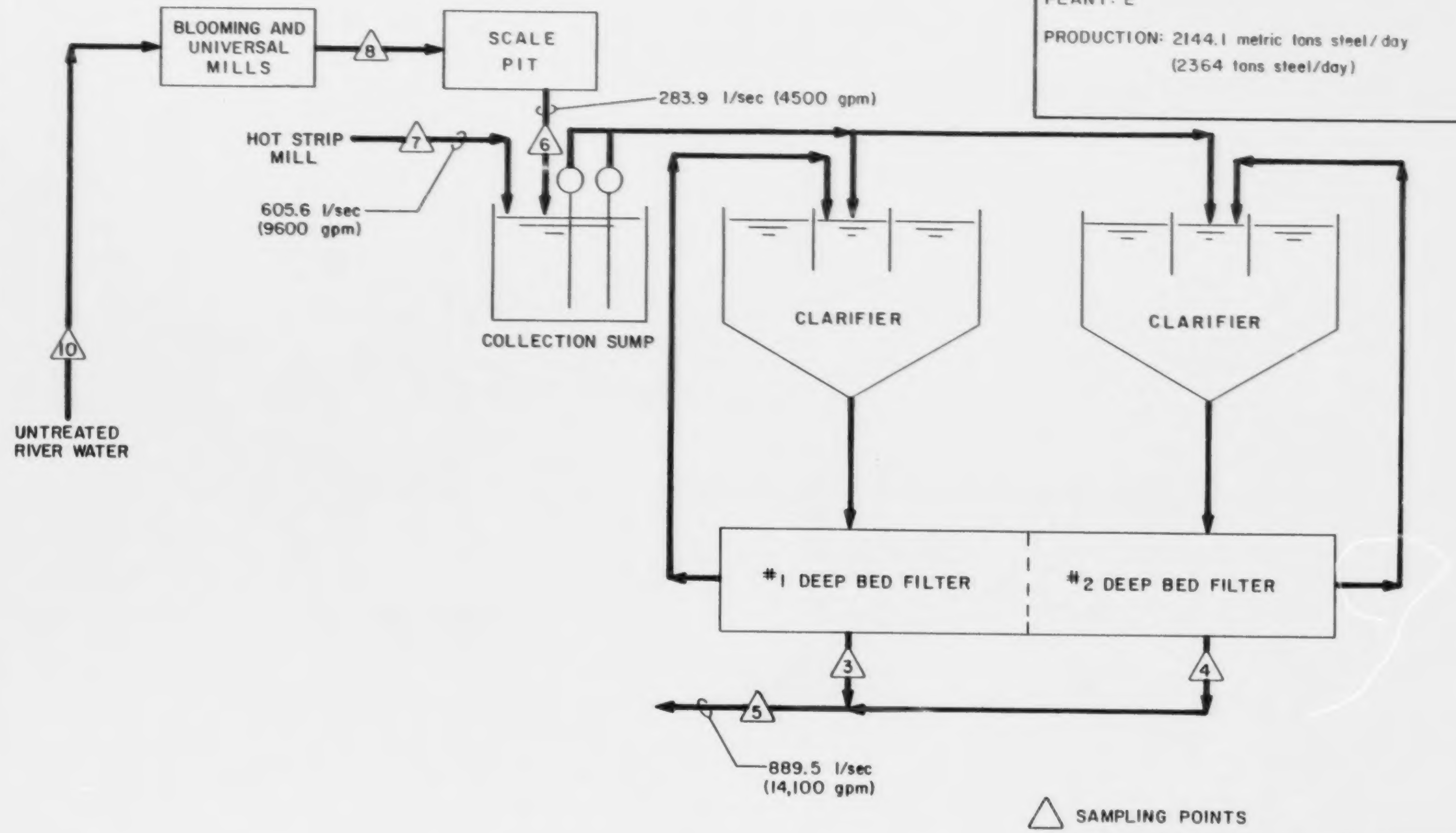
Dwn.3/23/79

FIGURE VII-3

PROCESS: Hot Forming - Blooming & Universal Mills

PLANT: E

PRODUCTION: 2144.1 metric tons steel/day
(2364 tons steel/day)


BLOOMING AND UNIVERSAL MILLS
8
SCALE PIT
283.9 l/sec (4500 gpm)
6
HOT STRIP MILL
7
605.6 l/sec (9600 gpm)
COLLECTION SUMP
10
UNTREATED RIVER WATER
CLARIFIER
CLARIFIER
#1 DEEP BED FILTER
#2 DEEP BED FILTER
3
4
5
889.5 l/sec (14,100 gpm)
SAMPLING POINTS

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING - PRIMARY
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

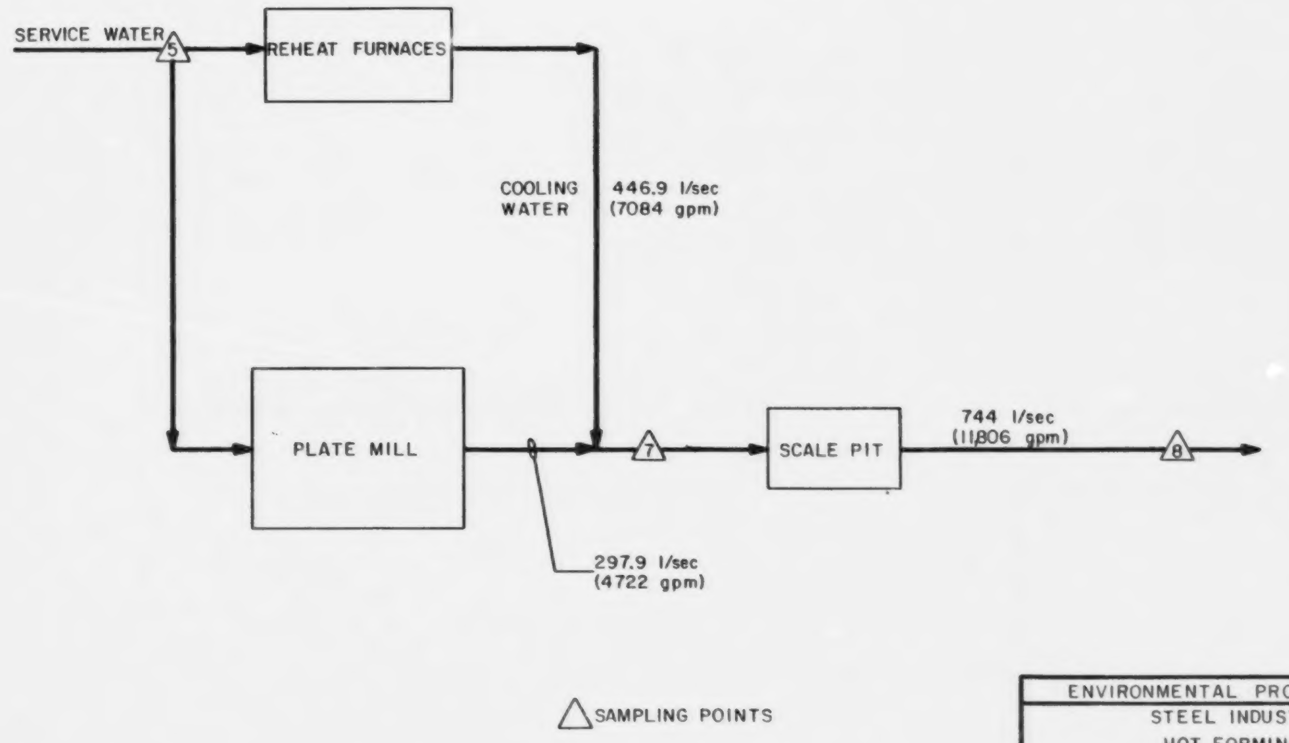
Dwn. 3/2/79

FIGURE VII-4

PROCESS: HOT FORMING - PLATE MILL

PLANT: F

PRODUCTION: 478.9 METRIC TONS STEEL/DAY
(528 TONS STEEL/DAY)


SERVICE WATER
5
REHEAT FURNACES
PLATE MILL
COOLING WATER
446.9 l/sec
(7084 gpm)
297.9 l/sec
(4722 gpm)
7
SCALE PIT
744 l/sec
(11,806 gpm)
8
SAMPLING POINTS

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT FORMING (FLAT)
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

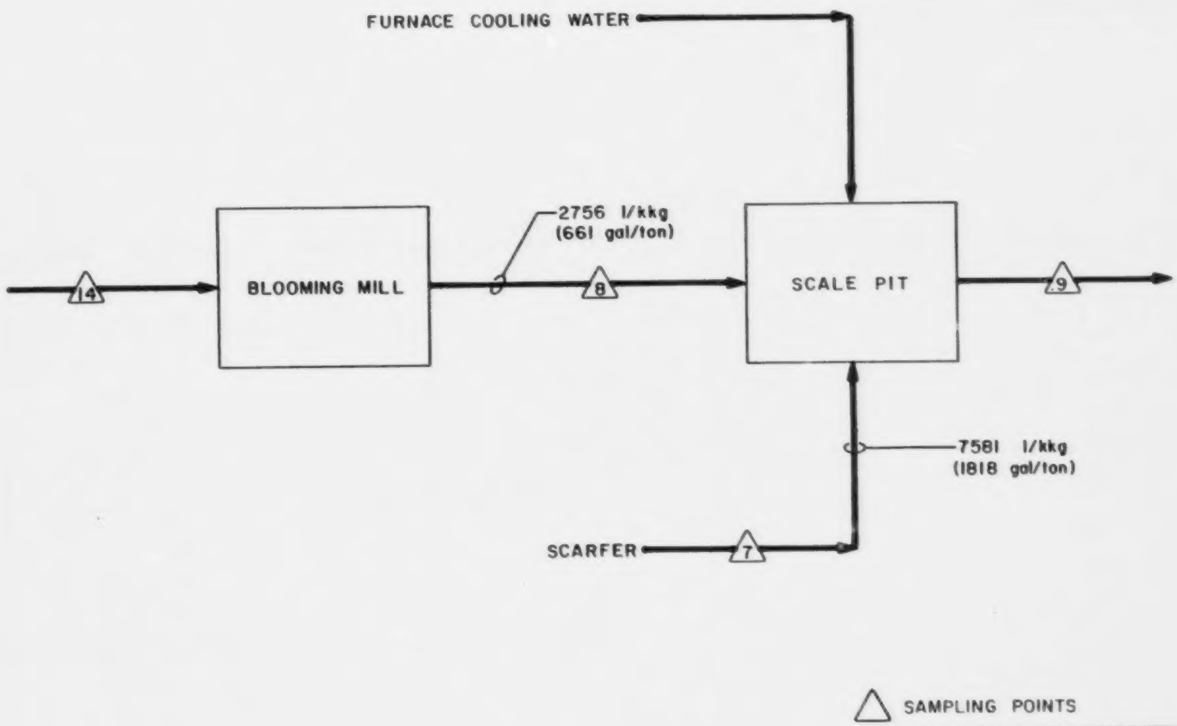
Dwn. 3/23/79

FIGURE VII-5

PROCESS: Hot Forming - Blooming Mill

PLANT: H

PRODUCTION:


FURNACE COOLING WATER
14
BLOOMING MILL
2756 l/kkg
(661 gal/ton)
8
SCALE PIT
9
7581 l/kkg
(1818 gal/ton)
SCARFER
7
SAMPLING POINTS

ENVIRONTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING-PRIMARY
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

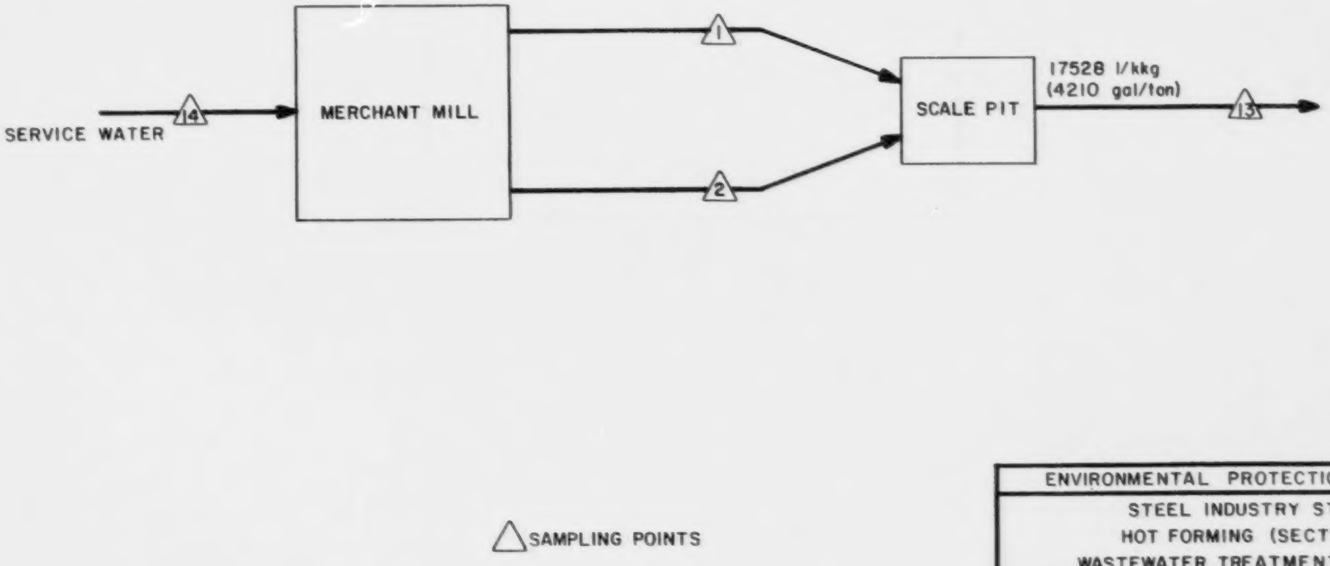
Dwn. 3/2/79

FIGURE VII-6

PROCESS: HOT FORMING - MERCHANT MILL

PLANT: H

PRODUCTION:


SERVICE WATER
14
MERCHANT MILL
1
2
SCALE PIT
17528 l/kkg
(4210 gal/ton)
13
SAMPLING POINTS

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING (SECTION)
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

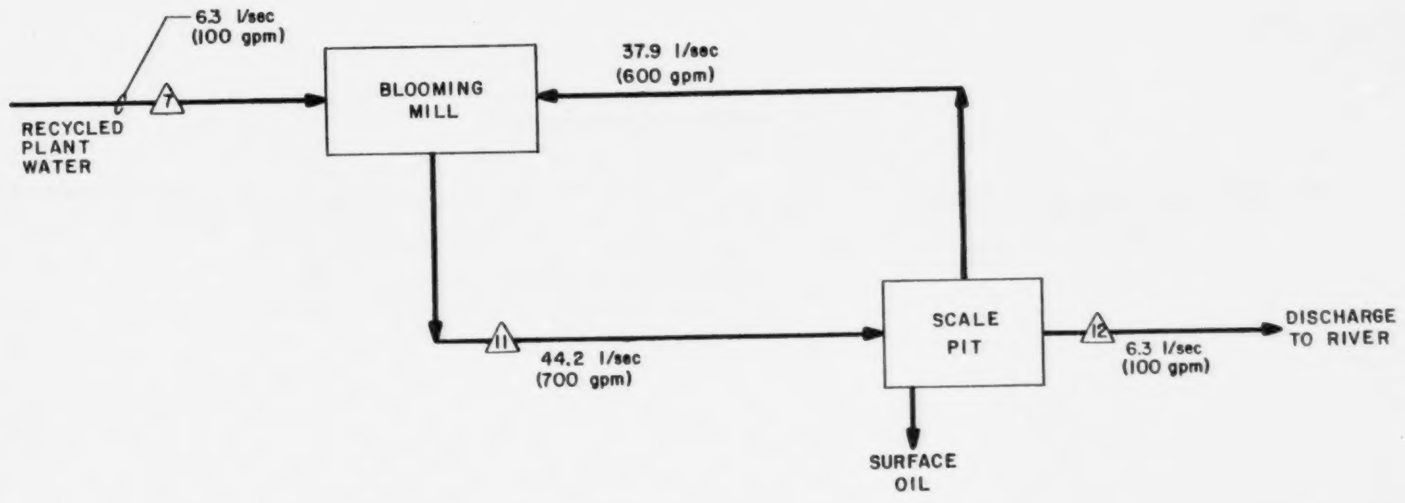
Dwn. 3/6/79

FIGURE VII-7

PROCESS: HOT FORMING (BLOOMING MILL)

PLANT: K

PRODUCTION 163.3 metric tons steel/day
(180 tons steel/day)


6.3 l/sec
(100 gpm)
7
RECYCLED
PLANT
WATER
BLOOMING
MILL
37.9 l/sec
(600 gpm)
11
44.2 l/sec
(700 gpm)
SCALE
PIT
SURFACE
OIL
12
6.3 l/sec
(100 gpm)
DISCHARGE
TO RIVER

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING (PRIMARY)
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

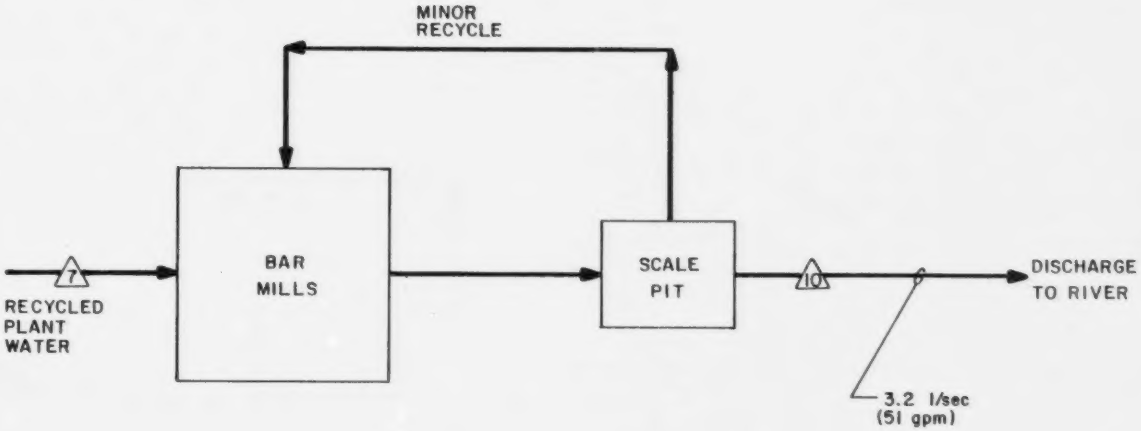
Dwn. 3/2/79

FIGURE VII-8

PROCESS: HOT FORMING (BAR MILLS)

PLANT: K

PRODUCTION 45.4 metric tons steel/day
(50 tons steel/day)


MINOR
RECYCLE
7
RECYCLED
PLANT
WATER
BAR
MILLS
SCALE
PIT
10
DISCHARGE
TO RIVER
3.2 l/sec
(51 gpm)

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT FORMING (SECTION)
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

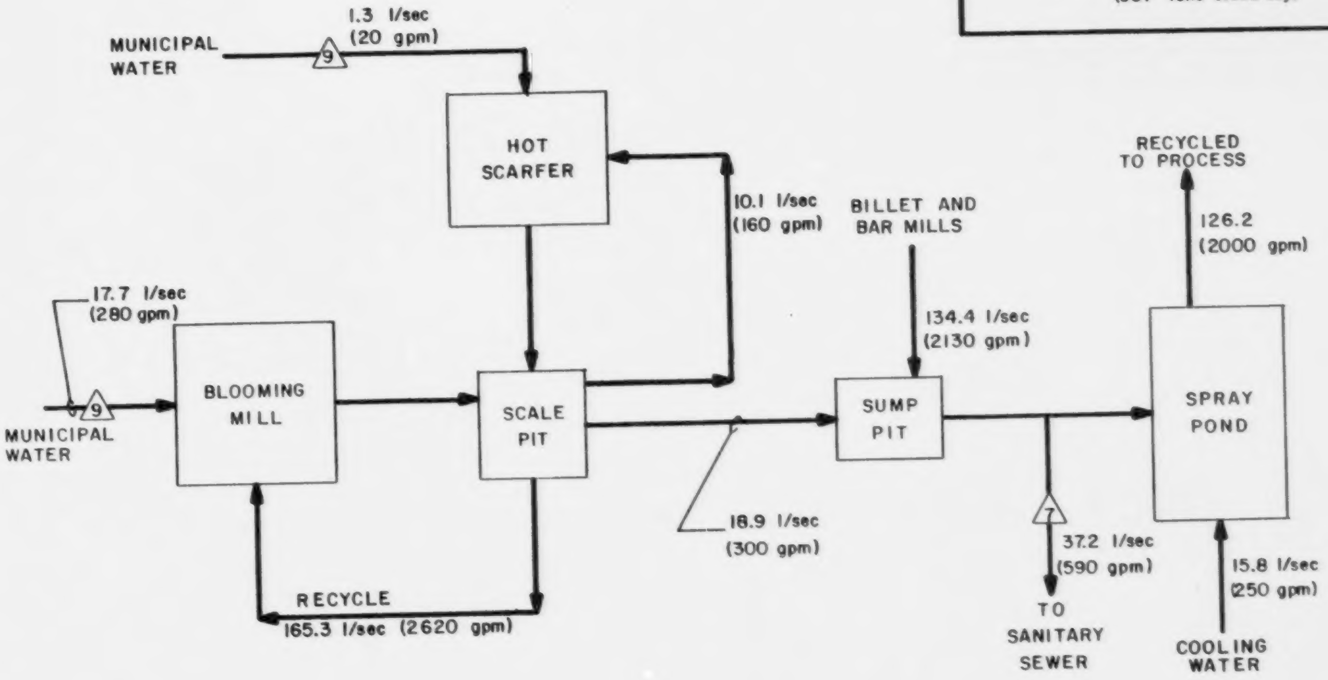
Dwn. 3/6/79

FIGURE VII-9

PROCESS: HOT FORMING (BLOOMING MILL)

PLANT: M

PRODUCTION: 895.2 metric tons steel/day
(987 tons steel/day)

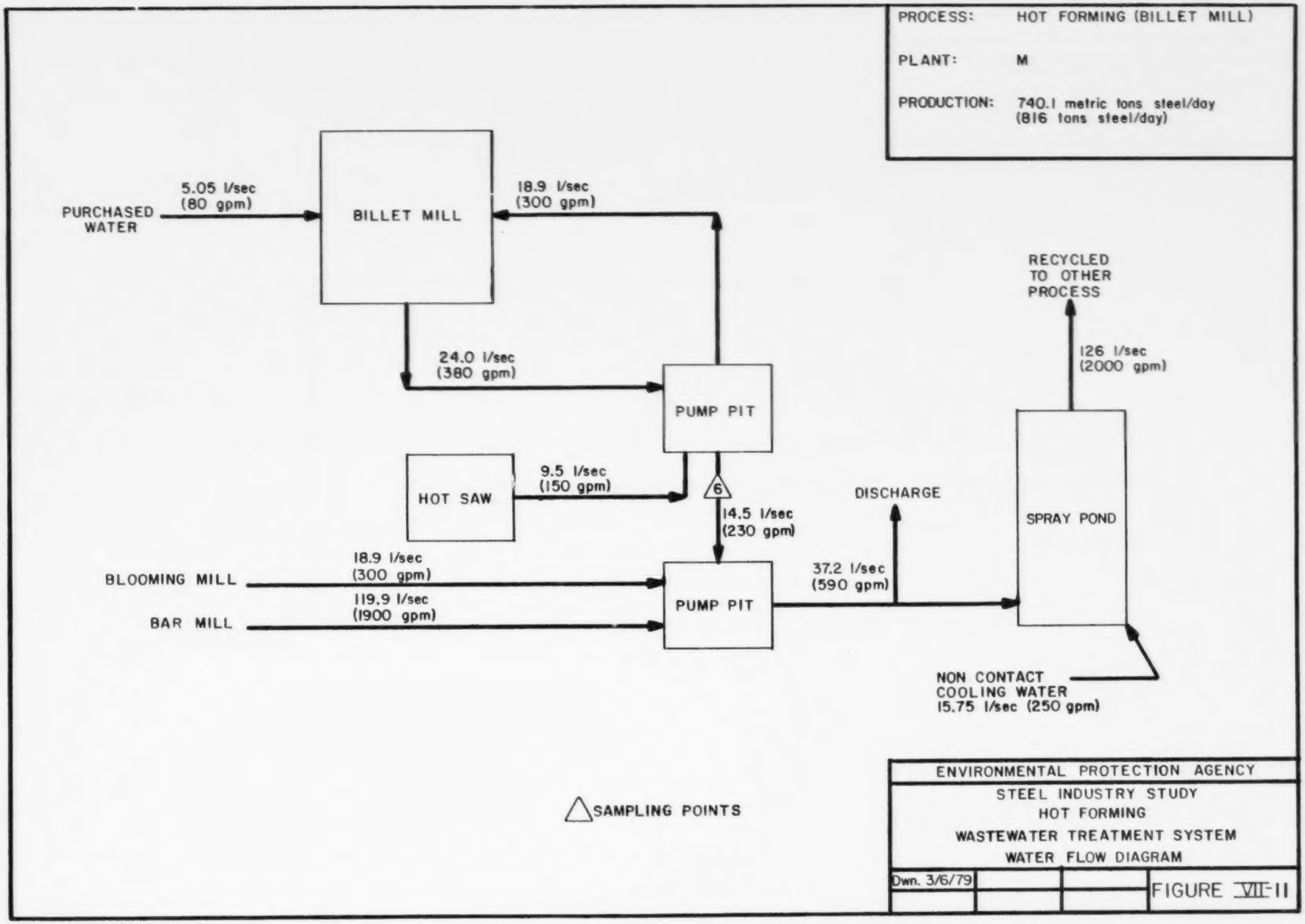

MUNICIPAL WATER
9
1.3 l/sec (20 gpm)
HOT SCARFER
10.1 l/sec (160 gpm)
17.7 l/sec (280 gpm)
9
MUNICIPAL WATER
BLOOMING MILL
SCALE PIT
RECYCLE
165.3 l/sec (2620 gpm)
18.9 l/sec (300 gpm)
BILLET AND BAR MILLS
134.4 l/sec (2130 gpm)
SUMP PIT
7
37.2 l/sec (590 gpm)
TO SANITARY SEWER
RECYCLED TO PROCESS
126.2 (2000 gpm)
SPRAY POND
15.8 l/sec (250 gpm)
COOLING WATER

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING (PRIMARY)
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwn. 3/2/79

FIGURE VII-10


PURCHASED WATER
5.05 l/sec (80 gpm)
BILLET MILL
18.9 l/sec (300 gpm)
24.0 l/sec (380 gpm)
PUMP PIT
HOT SAW
9.5 l/sec (150 gpm)
6
14.5 l/sec (230 gpm)
BLOOMING MILL
18.9 l/sec (300 gpm)
BAR MILL
119.9 l/sec (1900 gpm)
PUMP PIT
37.2 l/sec (590 gpm)
DISCHARGE
SPRAY POND
126 l/sec (2000 gpm)
RECYCLED TO OTHER PROCESS
NON CONTACT COOLING WATER 15.75 l/sec (250 gpm)
SAMPLING POINTS

PROCESS: HOT FORMING (BILLET MILL)

PLANT: M

PRODUCTION: 740.1 metric tons steel/day
(816 tons steel/day)

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT FORMING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

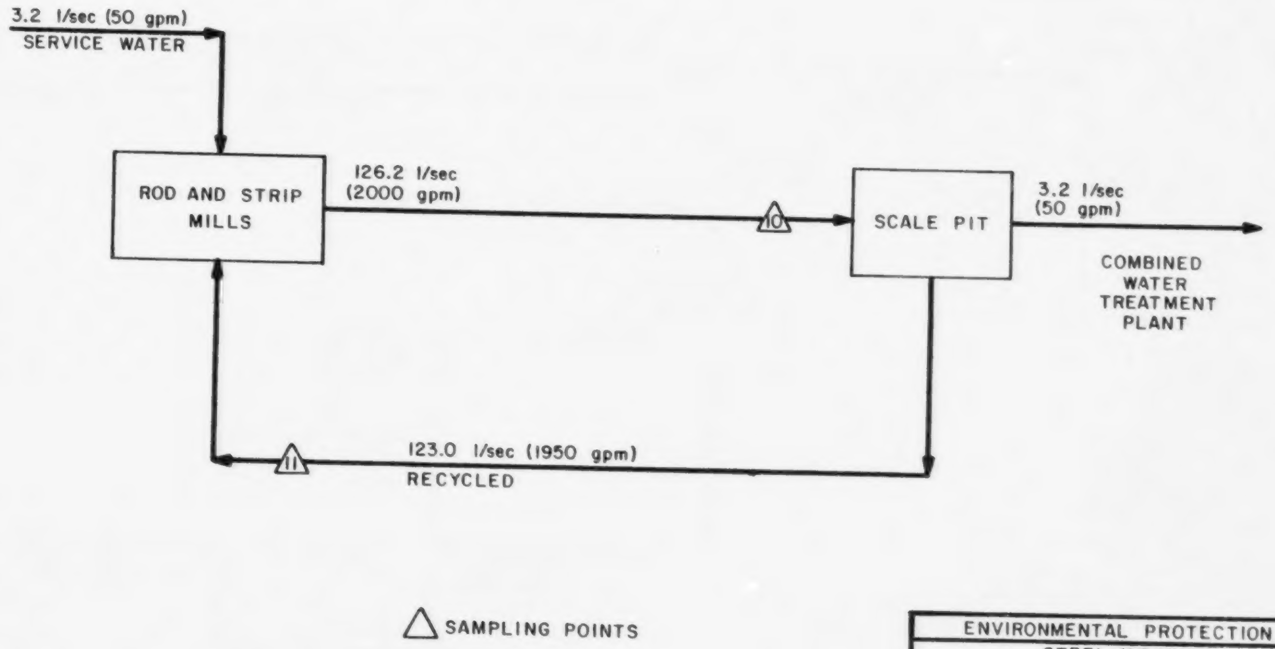
Dwn. 3/6/79

FIGURE VII-11

PROCESS: HOT FORMING - SECTION & FLAT

PLANT: O

PRODUCTION: 203.2 METRIC TONS STEEL/DAY
(224 TONS STEEL/DAY)


3.2 l/sec (50 gpm)
SERVICE WATER
ROD AND STRIP MILLS
126.2 l/sec (2000 gpm)
10
SCALE PIT
3.2 l/sec (50 gpm)
COMBINED WATER TREATMENT PLANT
11
123.0 l/sec (1950 gpm)
RECYCLED
SAMPLING POINTS

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT FORMING (SECTION & FLAT)
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

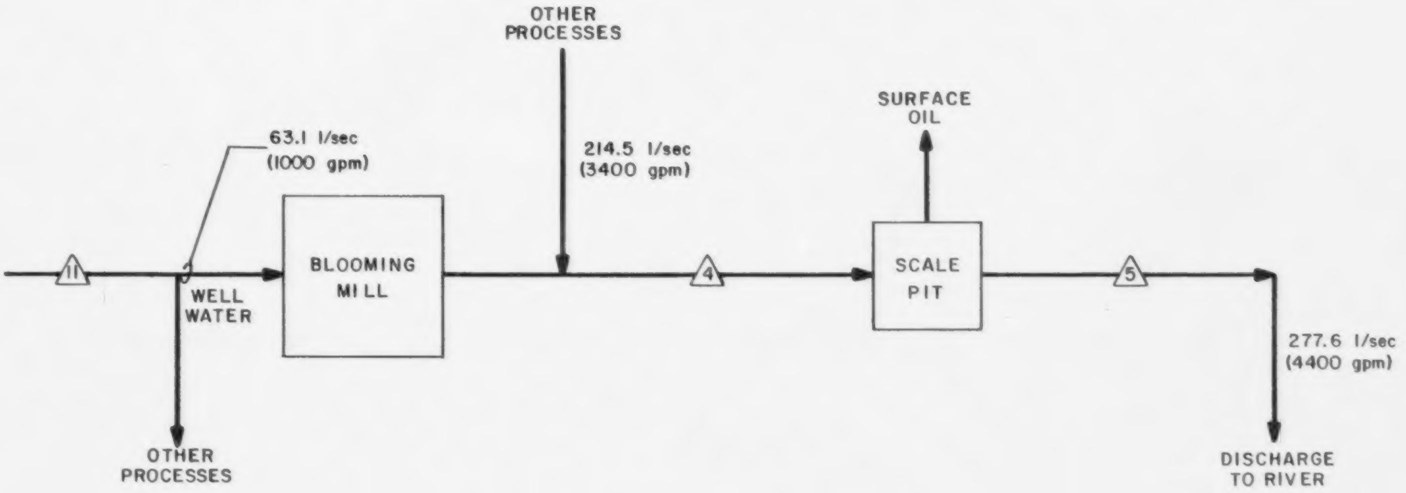
Dwn. 3/26/79

FIGURE VII-12

PROCESS: HOT FORMING (BLOOMING MILLS)

PLANT: Q

PRODUCTION: 381.8 metric tons steel/day
(421 tons steel/day)


OTHER PROCESSES
SURFACE OIL
63.1 l/sec
(1000 gpm)
214.5 l/sec
(3400 gpm)
11
WELL WATER
BLOOMING MILL
4
SCALE PIT
5
277.6 l/sec
(4400 gpm)
OTHER PROCESSES
DISCHARGE TO RIVER

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING (PRIMARY)
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

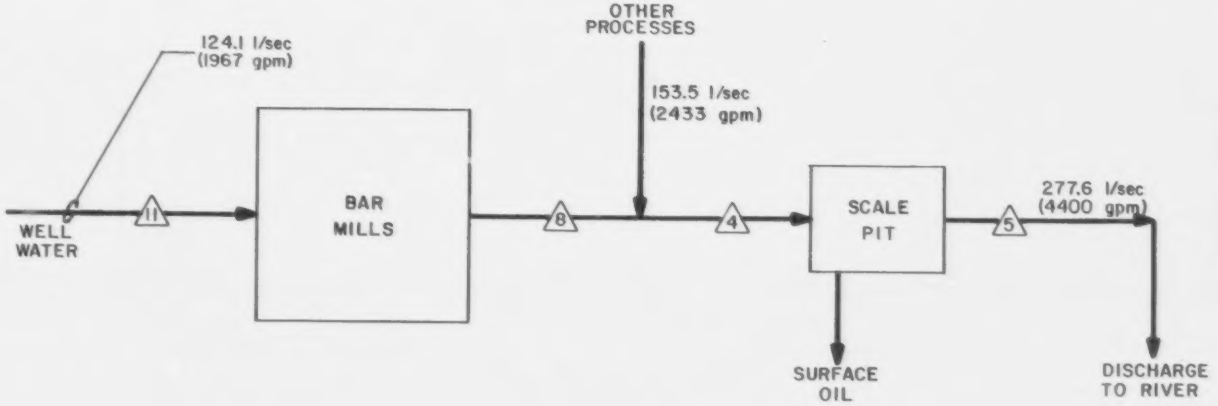
Dwn. 3/2/79

FIGURE VII-13

PROCESS: HOT FORMING (BAR MILLS)

PLANT: Q

PRODUCTION 1443.0 metric tons steel/day
(1591 tons steel/day)

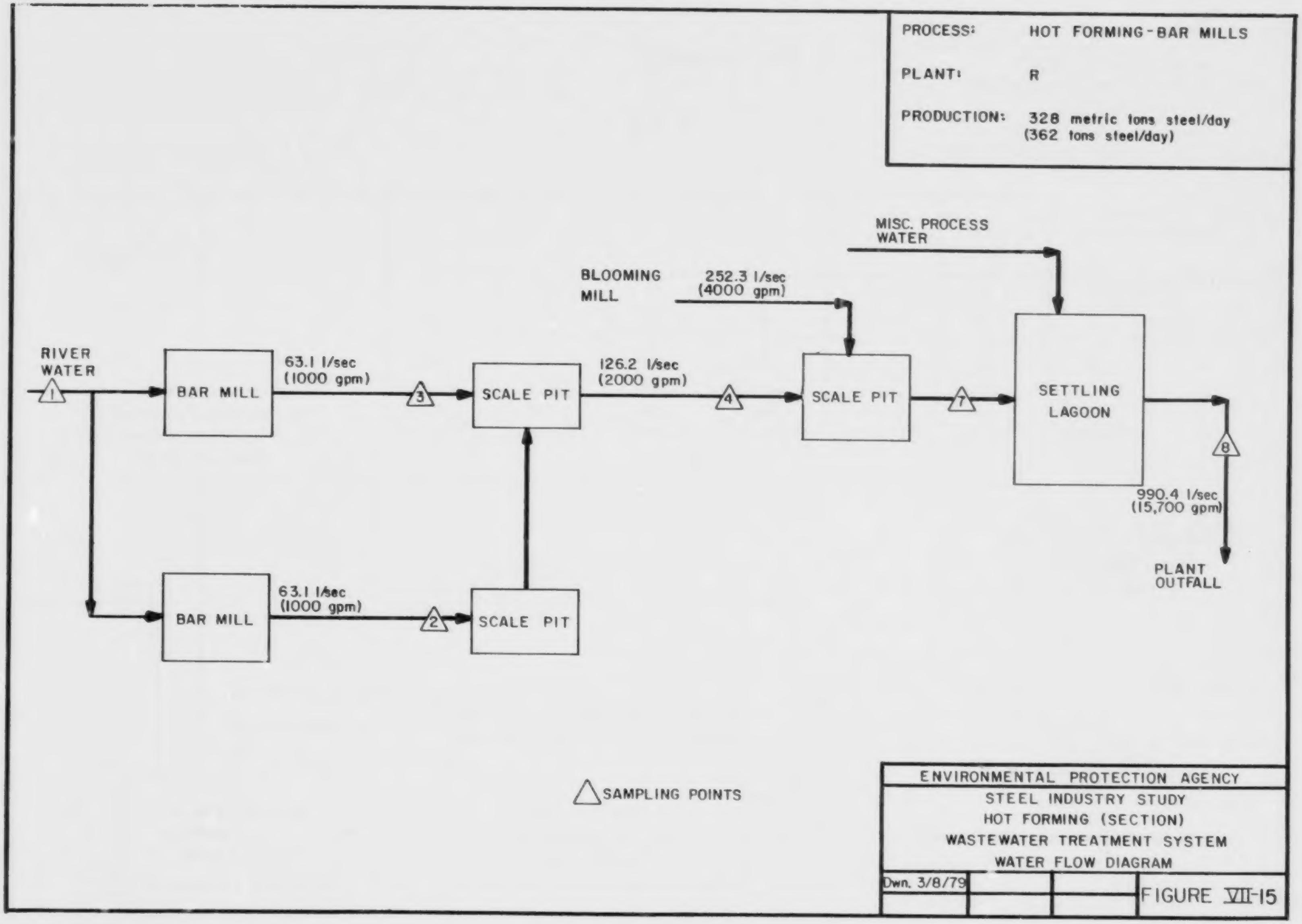

124.1 l/sec
(1967 gpm)
WELL WATER
11
BAR MILLS
8
OTHER PROCESSES
153.5 l/sec
(2433 gpm)
4
SCALE PIT
SURFACE OIL
5
277.6 l/sec
(4400 gpm)
DISCHARGE TO RIVER

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING (SECTION)
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwn. 3/7/79

FIGURE VII-14


RIVER WATER
1
BAR MILL
63.1 l/sec (1000 gpm)
3
BAR MILL
63.1 l/sec (1000 gpm)
2
SCALE PIT
SCALE PIT
126.2 l/sec (2000 gpm)
4
BLOOMING MILL
252.3 l/sec (4000 gpm)
SCALE PIT
7
MISC. PROCESS WATER
SETTLING LAGOON
8
990.4 l/sec (15,700 gpm)
PLANT OUTFALL
SAMPLING POINTS

PROCESS: HOT FORMING-BAR MILLS

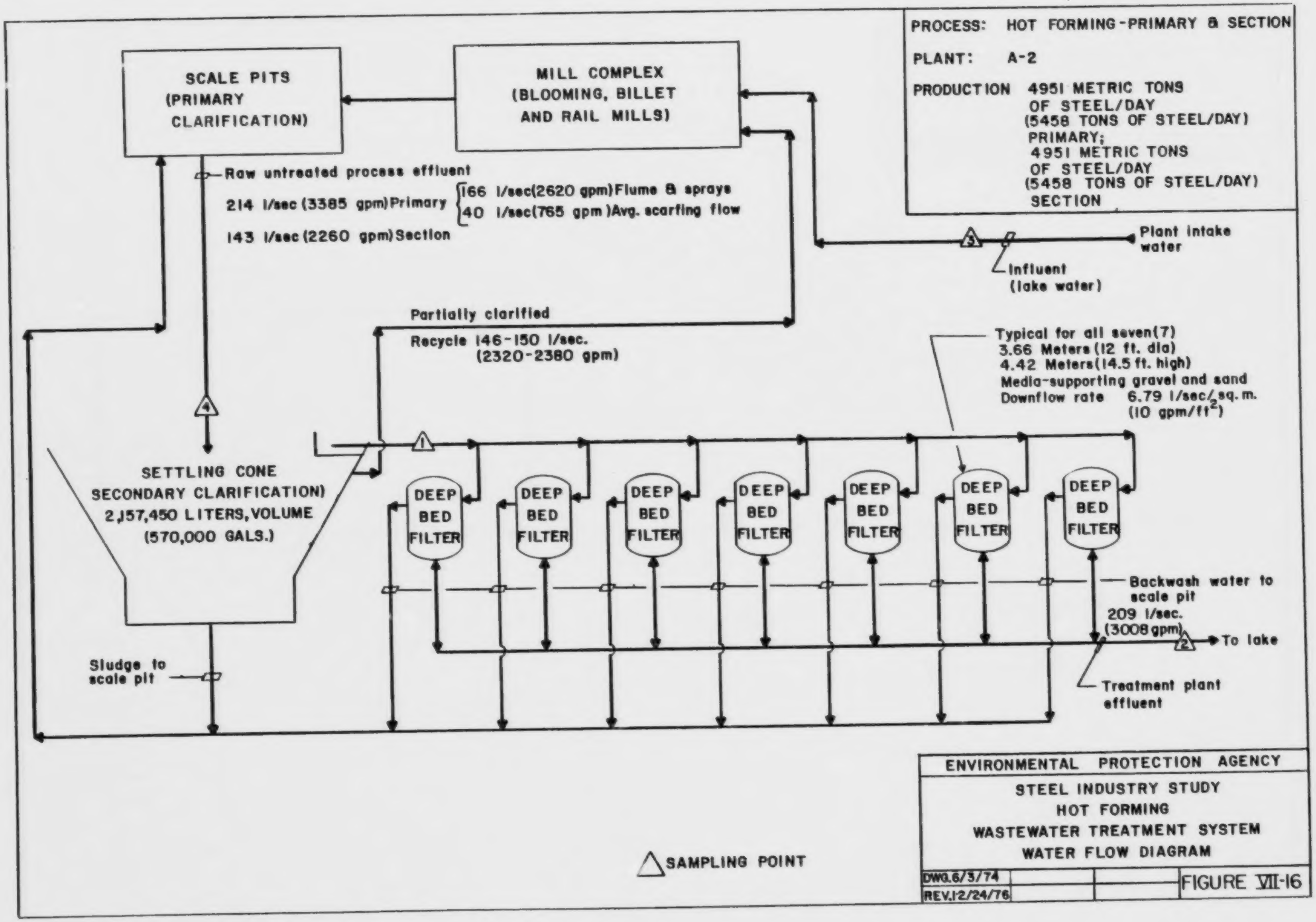
PLANT: R

PRODUCTION: 328 metric tons steel/day
(362 tons steel/day)

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT FORMING (SECTION)
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwn. 3/8/79

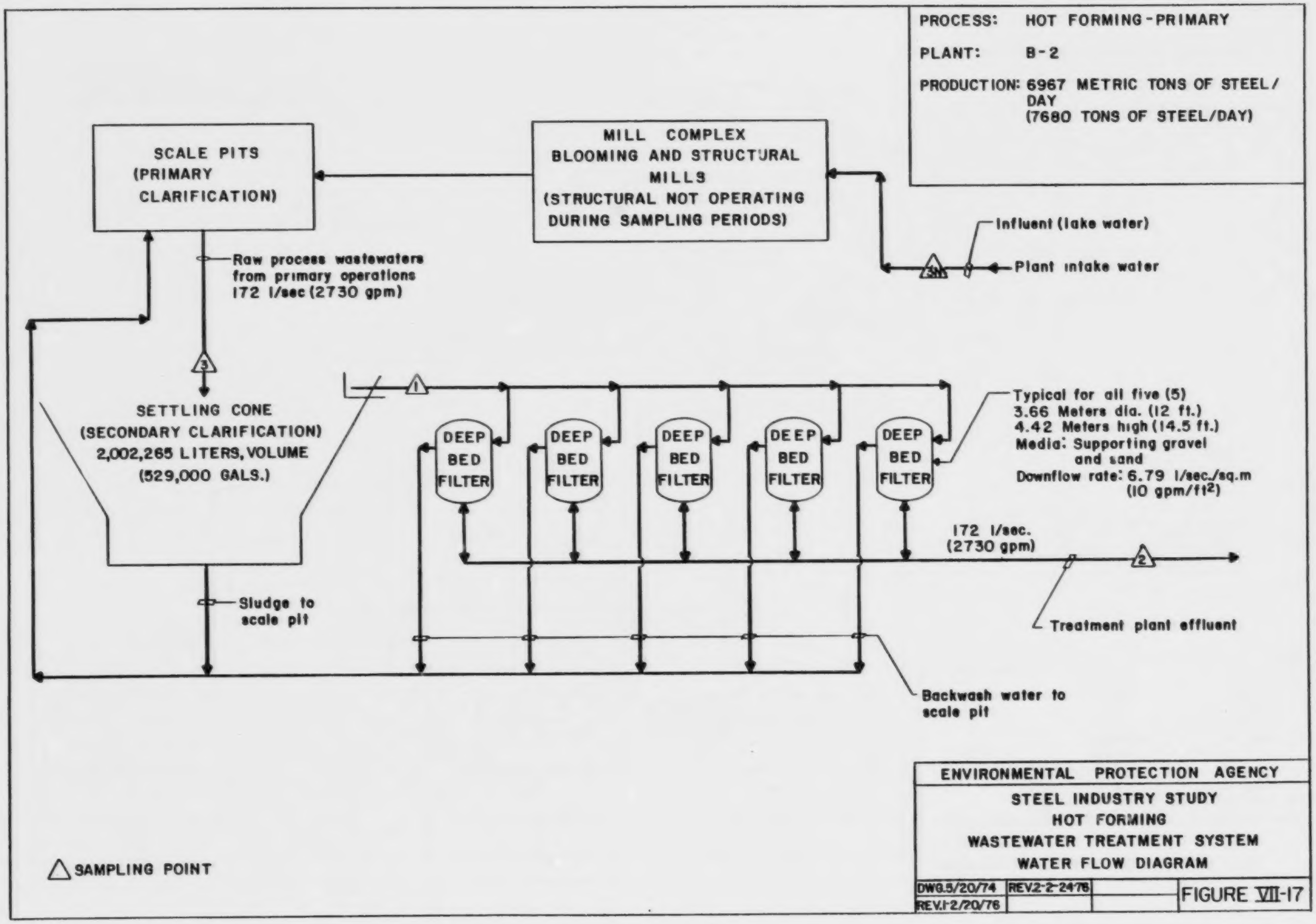
FIGURE VII-15


PROCESS: HOT FORMING-PRIMARY & SECTION
PLANT: A-2
PRODUCTION 4951 METRIC TONS OF STEEL/DAY (5458 TONS OF STEEL/DAY) PRIMARY; 4951 METRIC TONS OF STEEL/DAY (5458 TONS OF STEEL/DAY) SECTION
SCALE PITS (PRIMARY CLARIFICATION)
MILL COMPLEX (BLOOMING, BILLET AND RAIL MILLS)
Raw untreated process effluent
214 l/sec (3385 gpm) Primary
166 l/sec (2620 gpm) Flume & sprays
40 l/sec (765 gpm) Avg. scarfing flow
143 l/sec (2260 gpm) Section
Plant intake water
Influent (lake water)
3
Partially clarified
Recycle 146-150 l/sec. (2320-2380 gpm)
4
1
SETTLING CONE SECONDARY CLARIFICATION) 2,157,450 LITERS, VOLUME (570,000 GALS.)
Typical for all seven(7)
3.66 Meters (12 ft. dia)
4.42 Meters (14.5 ft. high)
Media-supporting gravel and sand
Downflow rate 6.79 l/sec/sq. m. (10 gpm/ft²)
DEEP BED FILTER
DEEP BED FILTER
DEEP BED FILTER
DEEP BED FILTER
DEEP BED FILTER
DEEP BED FILTER
DEEP BED FILTER
Backwash water to scale pit
209 l/sec. (3008 gpm)
2
To lake
Treatment plant effluent
Sludge to scale pit
SAMPLING POINT
DWG.6/3/74
REV.12/24/76

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-16

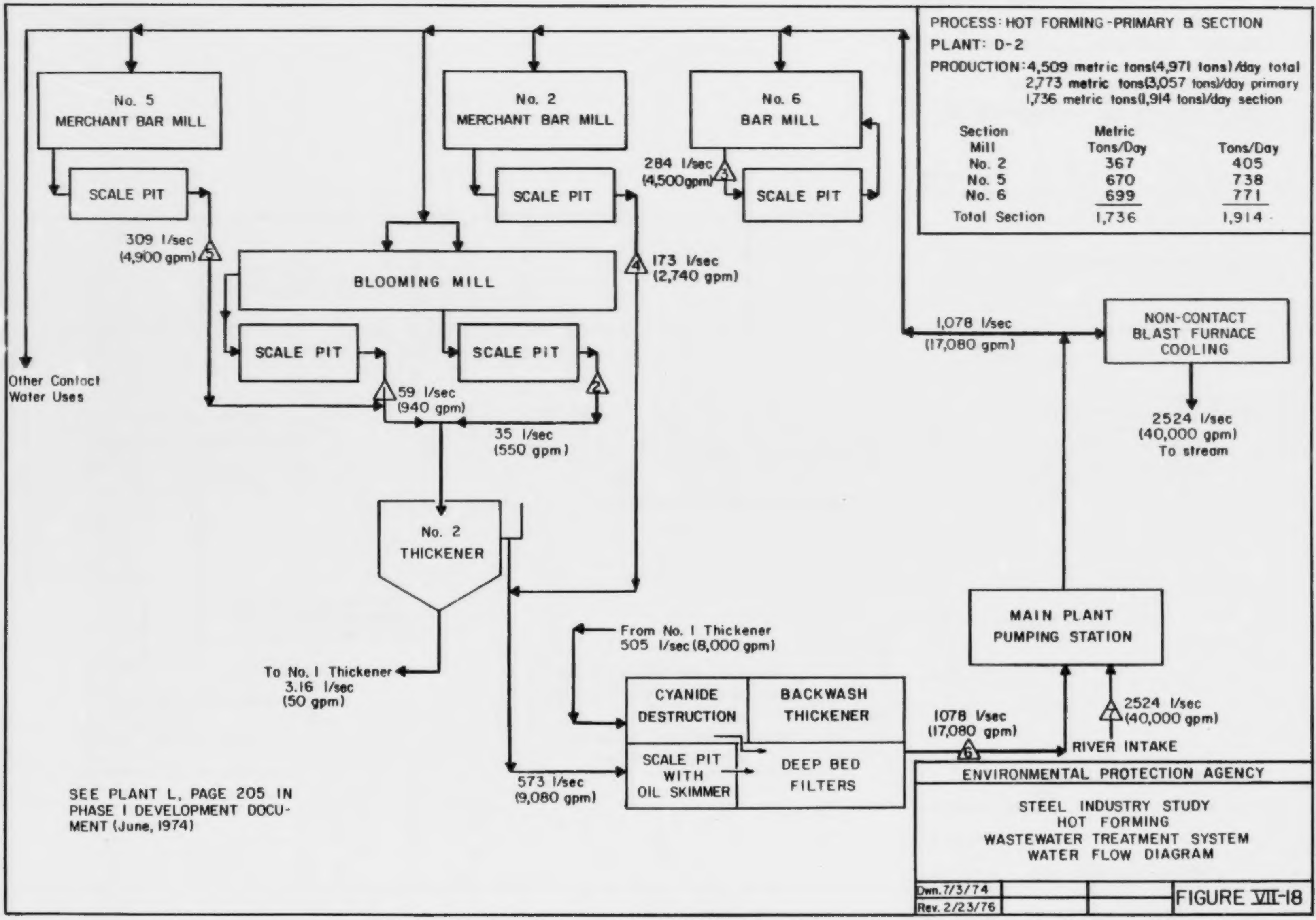

PROCESS: HOT FORMING-PRIMARY
PLANT: B-2
PRODUCTION: 6967 METRIC TONS OF STEEL/DAY (7680 TONS OF STEEL/DAY)
SCALE PITS (PRIMARY CLARIFICATION)
MILL COMPLEX BLOOMING AND STRUCTURAL MILLS (STRUCTURAL NOT OPERATING DURING SAMPLING PERIODS)
Influent (lake water)
3N
Plant intake water
Raw process wastewaters from primary operations 172 l/sec (2730 gpm)
3
SETTLING CONE (SECONDARY CLARIFICATION) 2,002,265 LITERS, VOLUME (529,000 GALS.)
1
DEEP BED FILTER
DEEP BED FILTER
DEEP BED FILTER
DEEP BED FILTER
DEEP BED FILTER
Typical for all five (5)
3.66 Meters dia. (12 ft.)
4.42 Meters high (14.5 ft.)
Media: Supporting gravel and sand
Downflow rate: 6.79 l/sec./sq.m (10 gpm/ft²)
172 l/sec. (2730 gpm)
2
Treatment plant effluent
Sludge to scale pit
Backwash water to scale pit
△ SAMPLING POINT

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

DWG.5/20/74 REV.2-2-24-76
REV.1-2/20/76

FIGURE VII-17


No. 5
MERCHANT BAR MILL
No. 2
MERCHANT BAR MILL
No. 6
BAR MILL
SCALE PIT
SCALE PIT
SCALE PIT
284 l/sec
(4,500gpm)
3
309 l/sec
(4,900 gpm)
5
BLOOMING MILL
4
173 l/sec
(2,740 gpm)
SCALE PIT
SCALE PIT
Other Contact
Water Uses
1
59 l/sec
(940 gpm)
2
35 l/sec
(550 gpm)
No. 2
THICKENER
To No. 1 Thickener
3.16 l/sec
(50 gpm)
From No. 1 Thickener
505 l/sec (8,000 gpm)
CYANIDE
DESTRUCTION
BACKWASH
THICKENER
SCALE PIT
WITH
OIL SKIMMER
DEEP BED
FILTERS
573 l/sec
(9,080 gpm)
1078 l/sec
(17,080 gpm)
6
1,078 l/sec
(17,080 gpm)
NON-CONTACT
BLAST FURNACE
COOLING
2524 l/sec
(40,000 gpm)
To stream
MAIN PLANT
PUMPING STATION
7
2524 l/sec
(40,000 gpm)
RIVER INTAKE

PROCESS: HOT FORMING - PRIMARY & SECTION

PLANT: D-2

PRODUCTION: 4,509 metric tons (4,971 tons)/day total
2,773 metric tons (3,057 tons)/day primary
1,736 metric tons (1,914 tons)/day section

Section Mill	Metric Tons/Day	Tons/Day
No. 2	367	405
No. 5	670	738
No. 6	699	771
Total Section	1,736	1,914

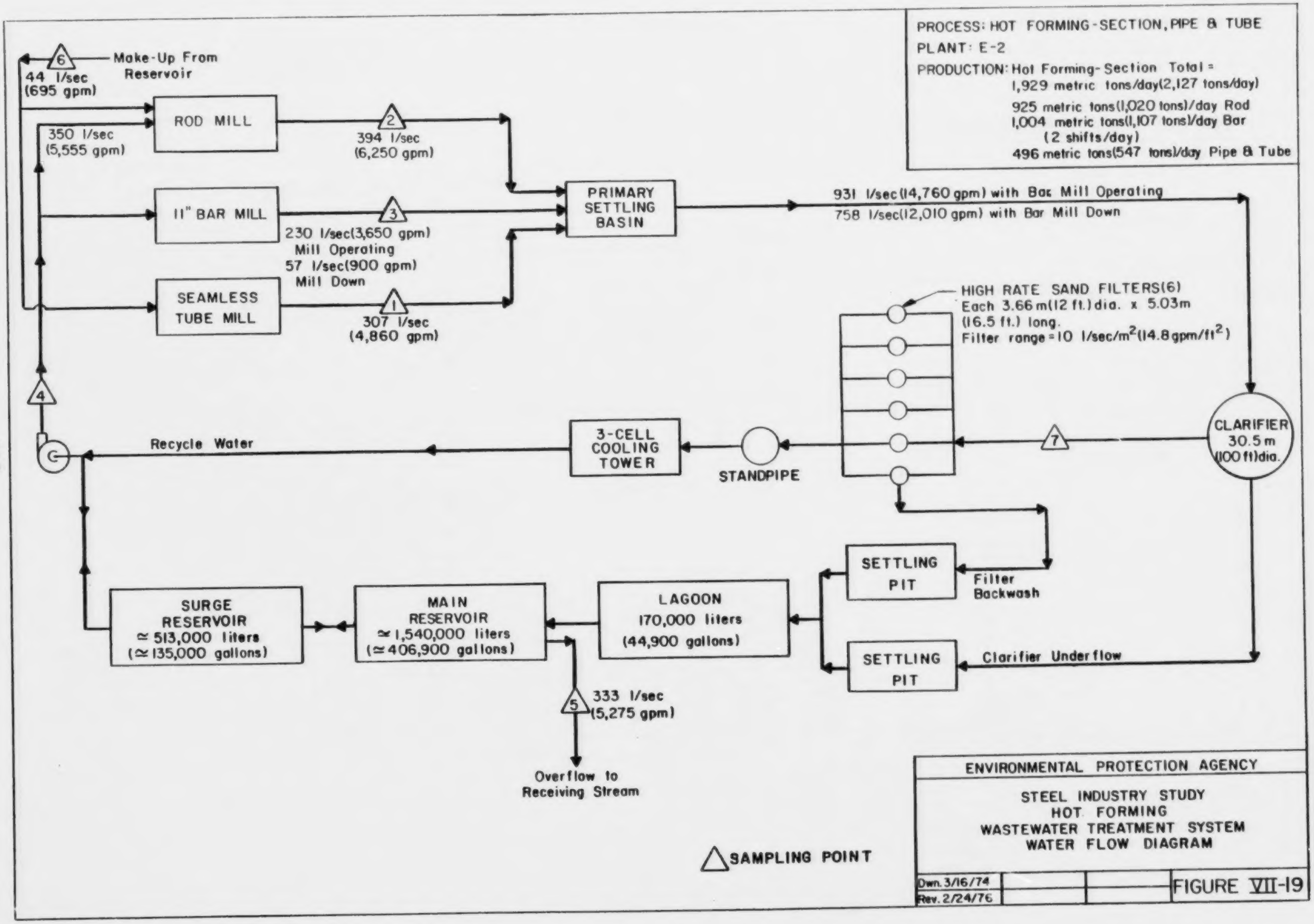
SEE PLANT L, PAGE 205 IN PHASE I DEVELOPMENT DOCUMENT (June, 1974)

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwn. 7/3/74
Rev. 2/23/76

FIGURE VII-18


Make-Up From Reservoir
44 l/sec (695 gpm)
6
350 l/sec (5,555 gpm)
ROD MILL
2
394 l/sec (6,250 gpm)
11" BAR MILL
3
230 l/sec(3,650 gpm) Mill Operating
57 l/sec(900 gpm) Mill Down
SEAMLESS TUBE MILL
1
307 l/sec (4,860 gpm)
PRIMARY SETTLING BASIN
931 l/sec(14,760 gpm) with Bar Mill Operating
758 l/sec(12,010 gpm) with Bar Mill Down
HIGH RATE SAND FILTERS(6) Each 3.66 m(12 ft.) dia. x 5.03m (16.5 ft.) long. Filter range = 10 l/sec/m²(14.8 gpm/ft²)
CLARIFIER 30.5 m (100 ft) dia.
7
4
Recycle Water
3-CELL COOLING TOWER
STANDPIPE
SETTLING PIT
Filter Backwash
SETTLING PIT
Clarifier Underflow
LAGOON 170,000 liters (44,900 gallons)
MAIN RESERVOIR ≃1,540,000 liters (≃406,900 gallons)
SURGE RESERVOIR ≃ 513,000 liters (≃135,000 gallons)
5
333 l/sec (5,275 gpm)
Overflow to Receiving Stream
△ SAMPLING POINT
Dwn. 3/16/74
Rev. 2/24/76

PROCESS: HOT FORMING-SECTION, PIPE & TUBE

PLANT: E-2

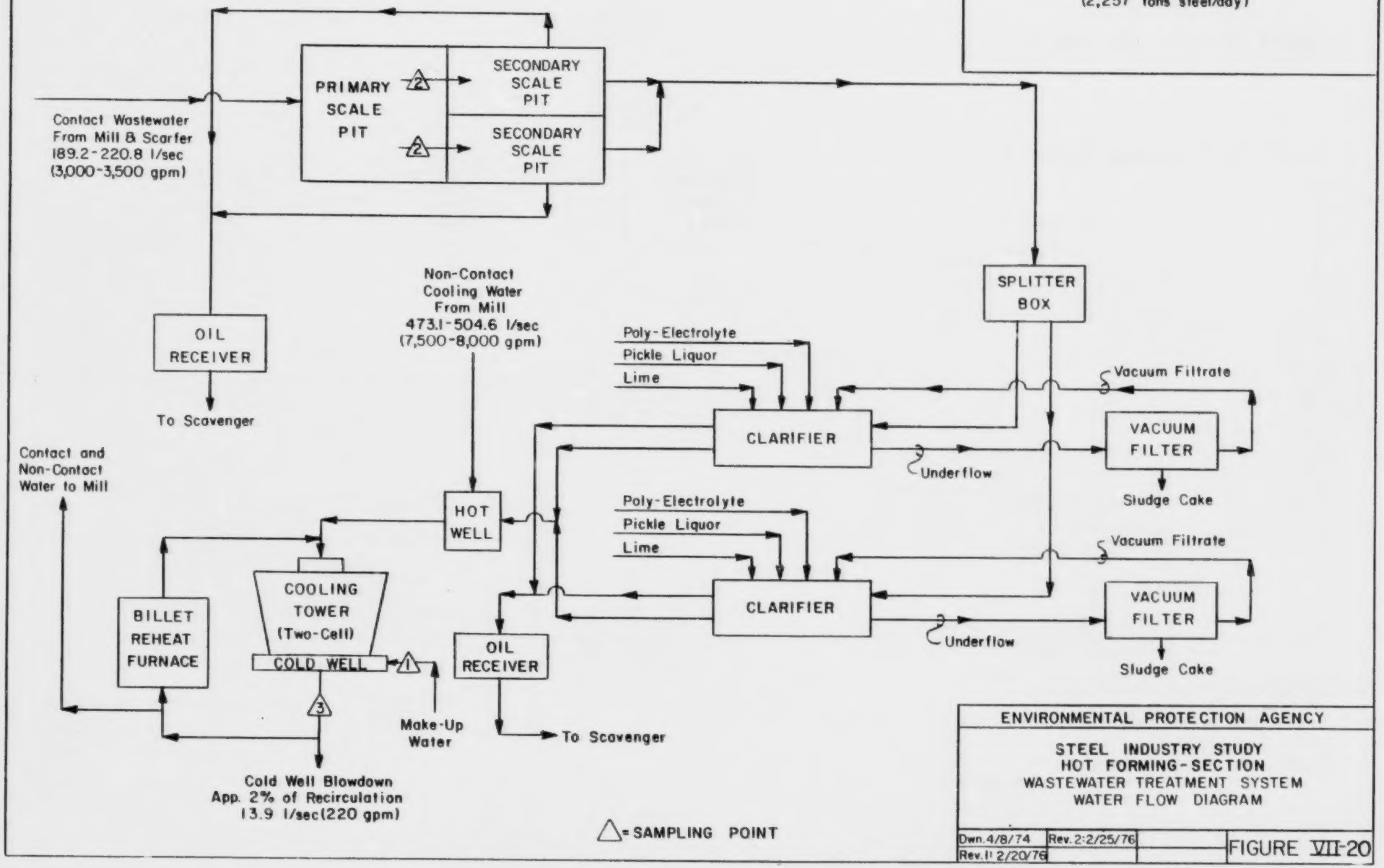
PRODUCTION: Hot Forming-Section Total =
1,929 metric tons/day(2,127 tons/day)
925 metric tons(1,020 tons)/day Rod
1,004 metric tons(1,107 tons)/day Bar
(2 shifts/day)
496 metric tons(547 tons)/day Pipe & Tube

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-19

PROCESS: HOT FORMING-SECTION
PLANT: F-2
PRODUCTION: 2,048 metric tons of steel/day
(2,257 tons steel/day)



PRIMARY SCALE PIT
SECONDARY SCALE PIT
SECONDARY SCALE PIT
2
2
Contact Wastewater From Mill & Scarfer 189.2-220.8 l/sec (3,000-3,500 gpm)
OIL RECEIVER
To Scavenger
SPLITTER BOX
Non-Contact Cooling Water From Mill 473.1-504.6 l/sec (7,500-8,000 gpm)
Poly-Electrolyte
Pickle Liquor
Lime
CLARIFIER
Vacuum Filtrate
VACUUM FILTER
Sludge Cake
Underflow
Poly-Electrolyte
Pickle Liquor
Lime
CLARIFIER
Vacuum Filtrate
VACUUM FILTER
Sludge Cake
Underflow
Contact and Non-Contact Water to Mill
HOT WELL
BILLET REHEAT FURNACE
COOLING TOWER (Two-Cell)
COLD WELL
1
3
Make-Up Water
OIL RECEIVER
To Scavenger
Cold Well Blowdown App. 2% of Recirculation 13.9 l/sec (220 gpm)
△= SAMPLING POINT

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING-SECTION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwn. 4/8/74	Rev. 2: 2/25/76	
Rev. 1: 2/20/76		

FIGURE VII-20

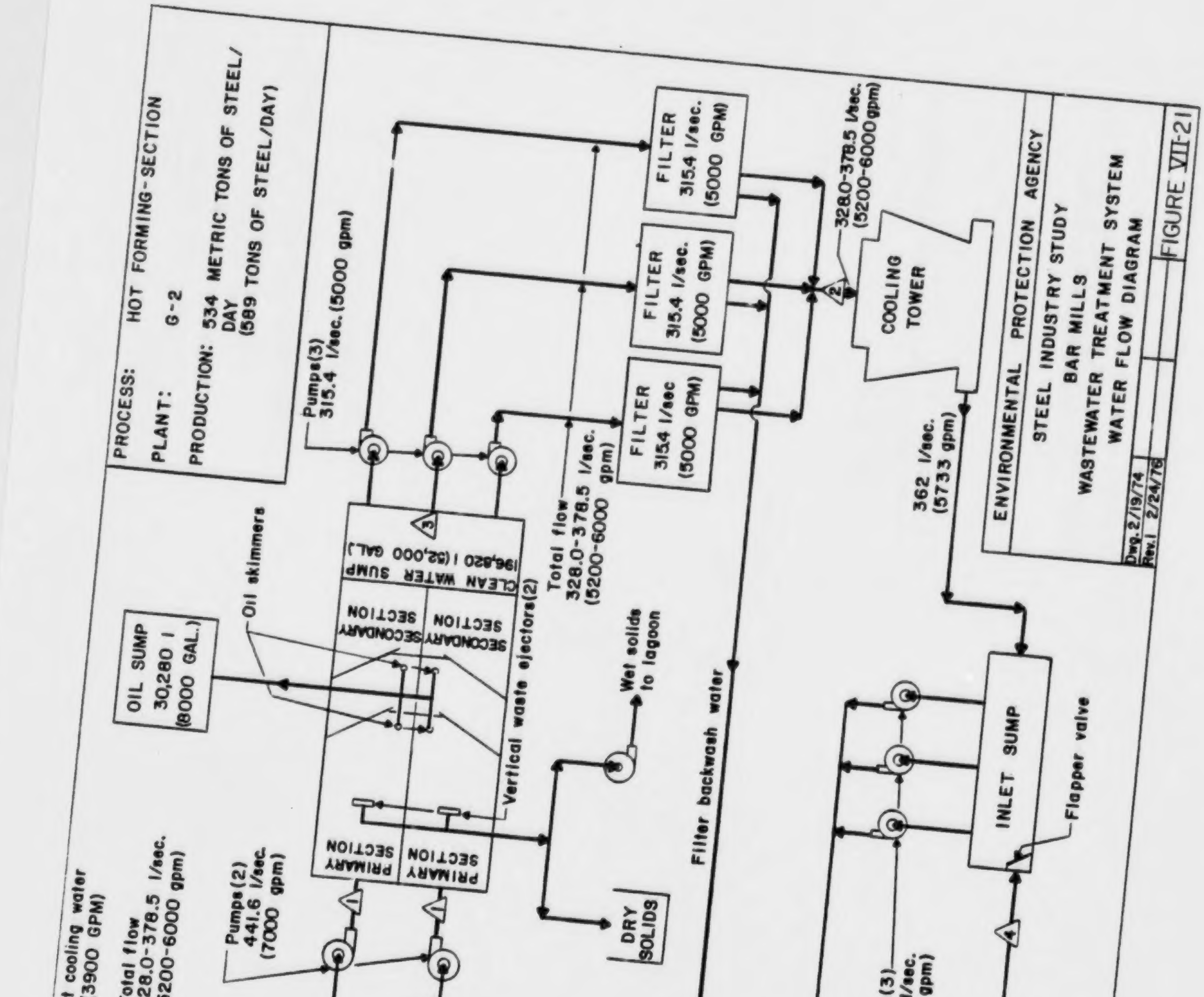
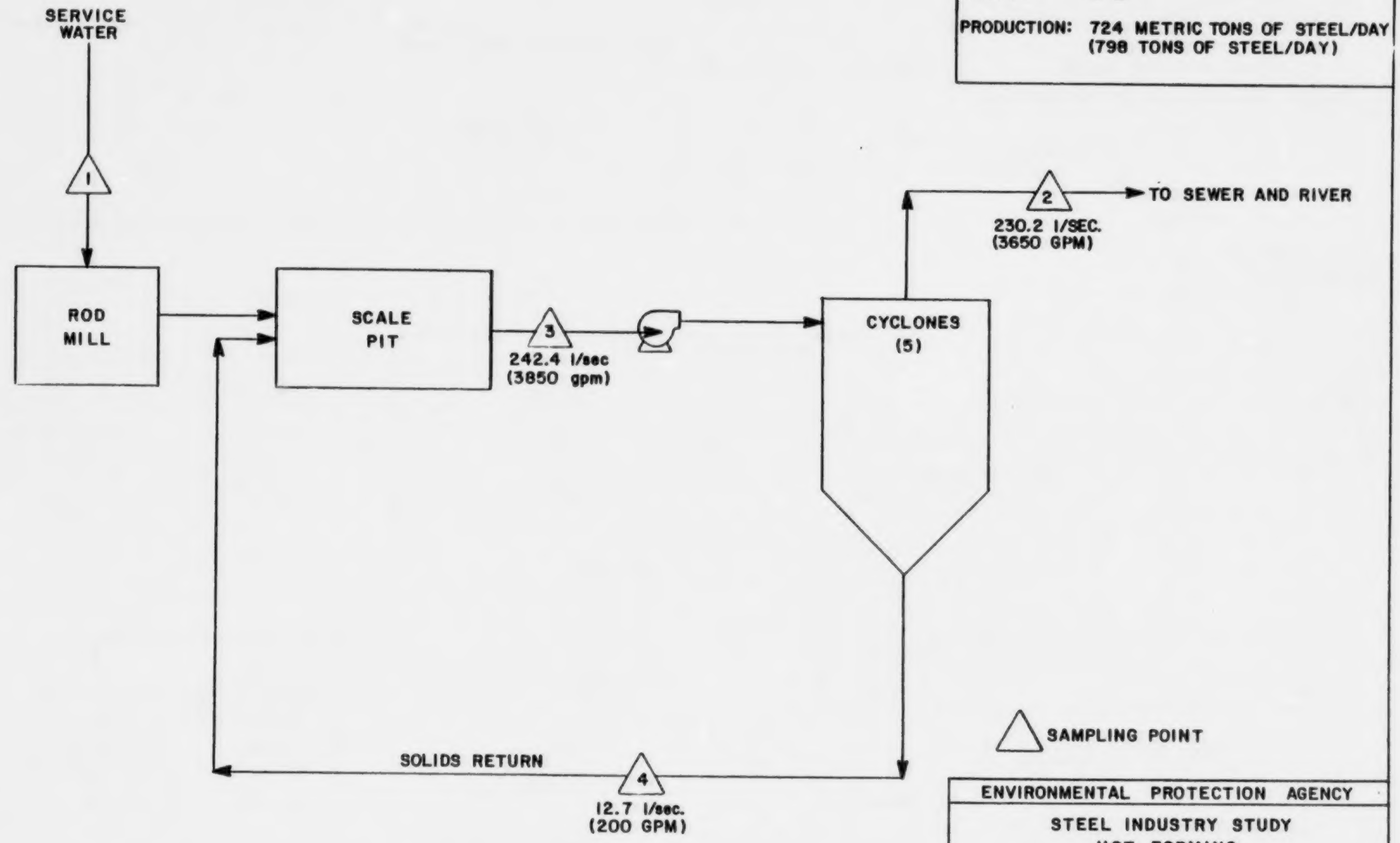

PROCESS: HOT FORMING-SECTION
PLANT: G-2
PRODUCTION: 534 METRIC TONS OF STEEL/DAY
(589 TONS OF STEEL/DAY)
10" & 12" BAR MILLS
10" MILL PRIMARY SCALE PITS(2)
12" MILL PRIMARY SCALE PITS(2)
Non-contact cooling water 246 l/sec (3900 GPM)
Total flow 328.0-378.5 l/sec. (5200-6000 gpm)
DIRTY WATER SUMP 170,325 l (45,000 GAL)
Pumps(2) 441.6 l/sec (7000 gpm)
1
PRIMARY SECTION
PRIMARY SECTION
SECONDARY SECTION
SECONDARY SECTION
CLEAN WATER SUMP 196,820 l (52,000 GAL.)
3
Oil skimmers
Vertical waste ejectors(2)
OIL SUMP 30,280 l (8000 GAL.)
Wet solids to lagoon
DRY SOLIDS
Pumps(3) 315.4 l/sec.(5000 gpm)
Total flow 328.0-378.5 l/sec. (5200-6000 gpm)
FILTER 315.4 l/sec (5000 GPM)
FILTER 315.4 l/sec. (5000 GPM)
FILTER 315.4 l/sec. (5000 GPM)
Filter backwash water
328.0-378.5 l/sec. (5200-6000 gpm)
2
COOLING TOWER
362 l/sec. (5733 gpm)
INLET SUMP
Flapper valve
Pumps(3) 315.4 l/sec. (5000 gpm)
4
Service water from river
SAMPLING POINT
ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
BAR MILLS
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM
Dwg. 2/19/74
Rev.1 2/24/76

FIGURE VII-21

PROCESS: HOT FORMING-SECTION
PLANT: H-2
PRODUCTION: 724 METRIC TONS OF STEEL/DAY
(798 TONS OF STEEL/DAY)


SERVICE WATER
1
ROD MILL
SCALE PIT
3
242.4 l/sec
(3850 gpm)
CYCLONES
(5)
2
230.2 l/SEC.
(3650 GPM)
TO SEWER AND RIVER
SOLIDS RETURN
4
12.7 l/sec.
(200 GPM)

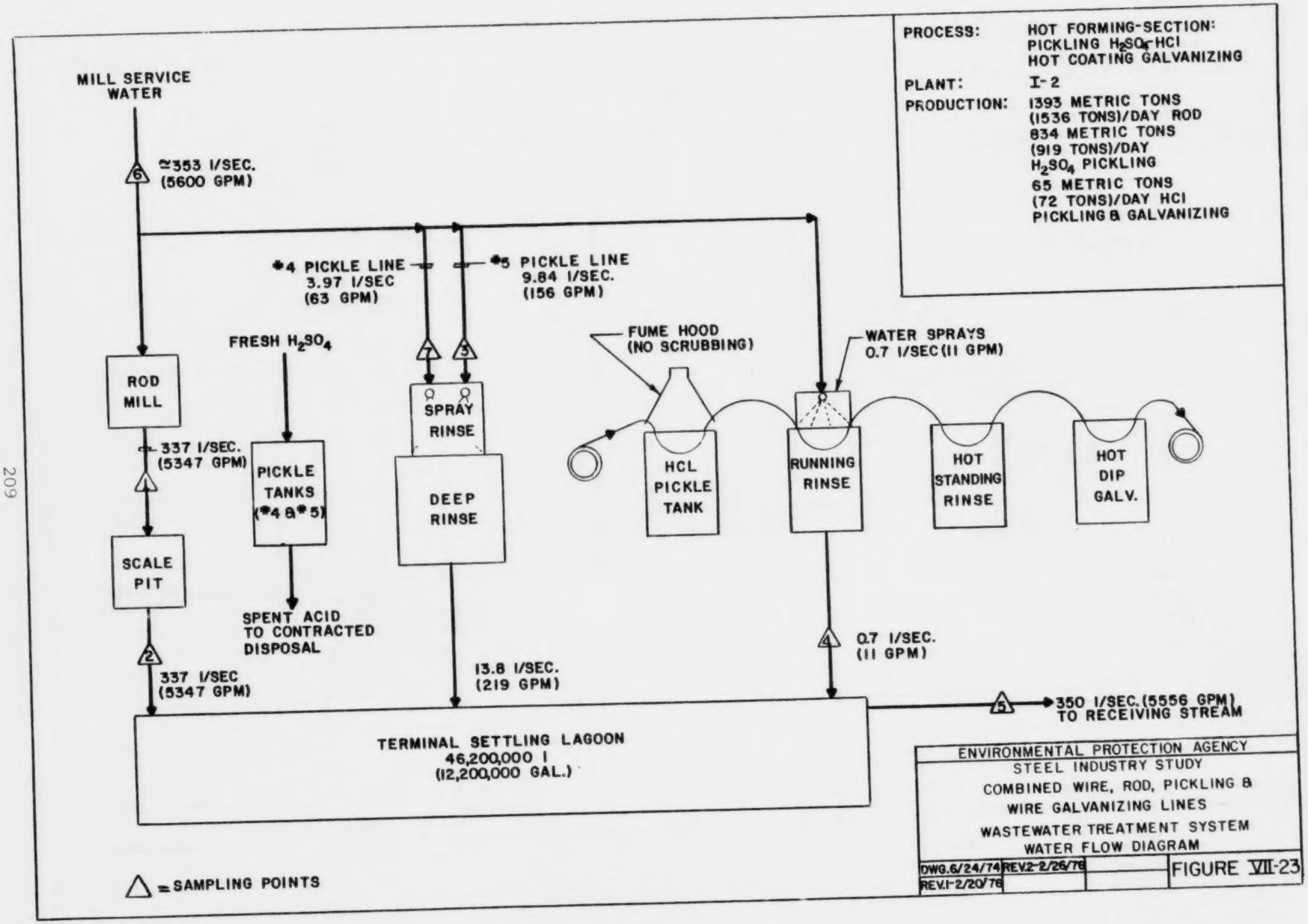
△ SAMPLING POINT

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwg. 4/2/74
Rev. 2/19/76

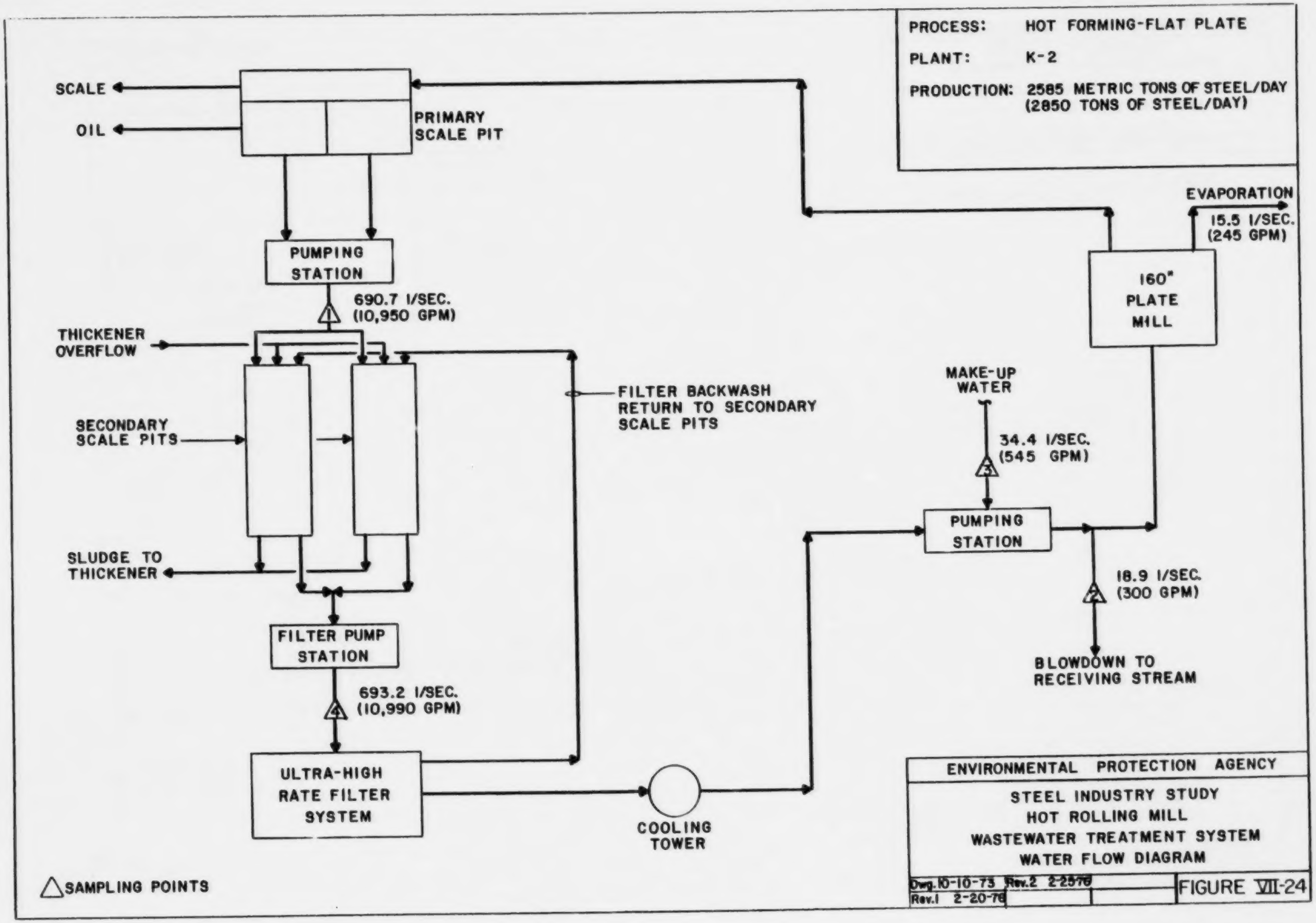
FIGURE VII-22


PROCESS: HOT FORMING-SECTION: PICKLING H_2SO_4-HCl HOT COATING GALVANIZING
PLANT: I-2
PRODUCTION: 1393 METRIC TONS (1536 TONS)/DAY ROD
834 METRIC TONS (919 TONS)/DAY H_2SO_4 PICKLING
65 METRIC TONS (72 TONS)/DAY HCl PICKLING & GALVANIZING
MILL SERVICE WATER
6
≃353 l/SEC. (5600 GPM)
ROD MILL
337 l/SEC. (5347 GPM)
1
SCALE PIT
2
337 l/SEC (5347 GPM)
FRESH H_2SO_4
PICKLE TANKS (#4 & #5)
SPENT ACID TO CONTRACTED DISPOSAL
#4 PICKLE LINE 3.97 l/SEC (63 GPM)
#5 PICKLE LINE 9.84 l/SEC. (156 GPM)
7
3
SPRAY RINSE
DEEP RINSE
13.8 l/SEC. (219 GPM)
FUME HOOD (NO SCRUBBING)
HCL PICKLE TANK
WATER SPRAYS 0.7 l/SEC (11 GPM)
RUNNING RINSE
HOT STANDING RINSE
HOT DIP GALV.
4
0.7 l/SEC. (11 GPM)
TERMINAL SETTLING LAGOON 46,200,000 l (12,200,000 GAL.)
5
350 l/SEC. (5556 GPM) TO RECEIVING STREAM
△ = SAMPLING POINTS

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COMBINED WIRE, ROD, PICKLING & WIRE GALVANIZING LINES
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

DWG. 6/24/74 REV. 1-2/20/76 REV. 2-2/26/76

FIGURE VII-23


SCALE
OIL
PRIMARY SCALE PIT
PUMPING STATION
690.7 l/SEC. (10,950 GPM)
1
THICKENER OVERFLOW
SECONDARY SCALE PITS
SLUDGE TO THICKENER
FILTER PUMP STATION
693.2 l/SEC. (10,990 GPM)
4
ULTRA-HIGH RATE FILTER SYSTEM
FILTER BACKWASH RETURN TO SECONDARY SCALE PITS
COOLING TOWER
MAKE-UP WATER
34.4 l/SEC. (545 GPM)
3
PUMPING STATION
18.9 l/SEC. (300 GPM)
2
BLOWDOWN TO RECEIVING STREAM
160" PLATE MILL
EVAPORATION
15.5 l/SEC. (245 GPM)
△SAMPLING POINTS

PROCESS: HOT FORMING-FLAT PLATE
PLANT: K-2
PRODUCTION: 2585 METRIC TONS OF STEEL/DAY
(2850 TONS OF STEEL/DAY)

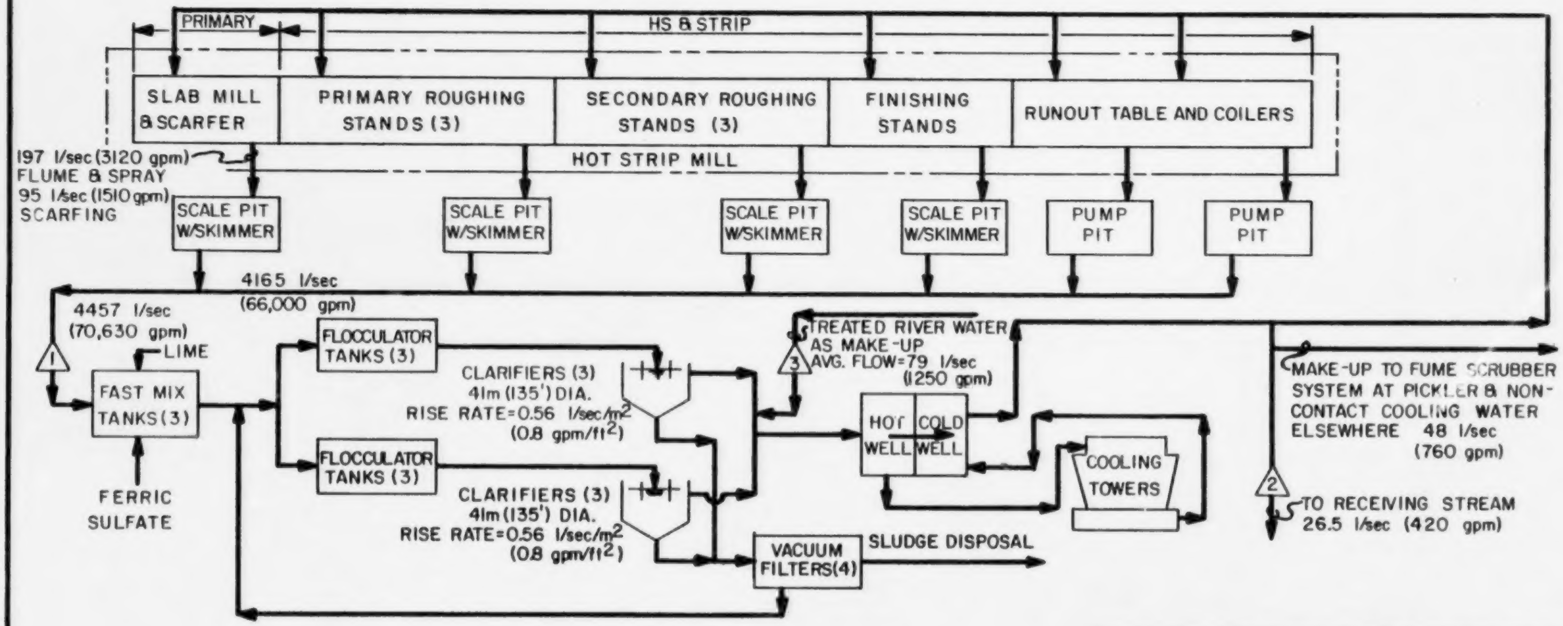
ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT ROLLING MILL
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwg. 10-10-73 Rev.2 2-25-76
Rev.1 2-20-76

FIGURE VII-24

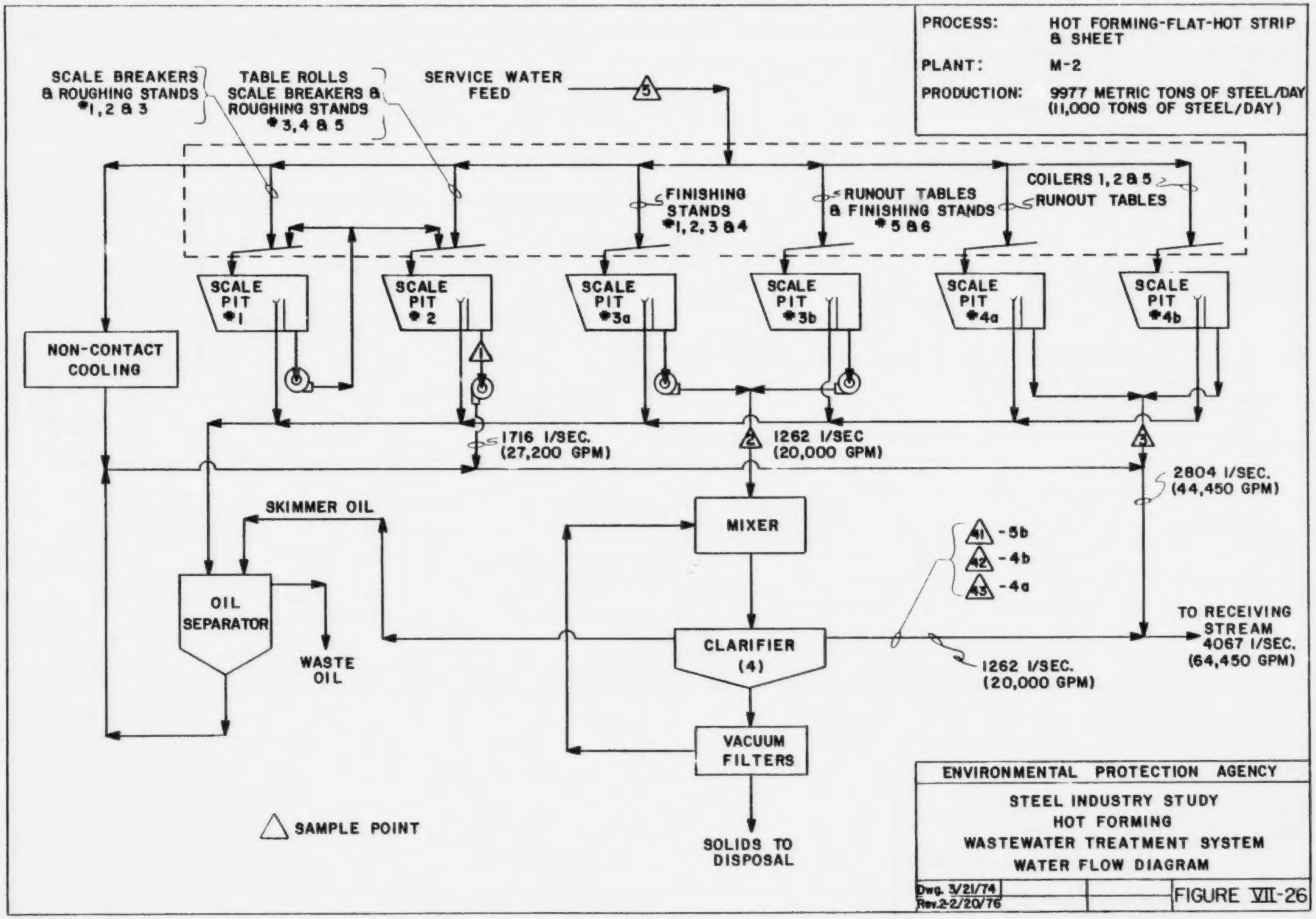
PROCESS: HOT FORMING - PRIMARY
HOT FORMING-FLAT-HOT STRIP & SHEET
PLANT: L-2
PRODUCTION: 9854 METRIC TONS
(10,864 TONS/DAY) PRIMARY
10,506 METRIC TONS
(11,583 TONS/DAY) FLAT


PRIMARY
HS & STRIP
SLAB MILL & SCARFER
PRIMARY ROUGHING STANDS (3)
SECONDARY ROUGHING STANDS (3)
FINISHING STANDS
RUNOUT TABLE AND COILERS
HOT STRIP MILL
197 l/sec (3120 gpm) FLUME & SPRAY
95 l/sec (1510 gpm) SCARFING
SCALE PIT W/SKIMMER
SCALE PIT W/SKIMMER
SCALE PIT W/SKIMMER
SCALE PIT W/SKIMMER
PUMP PIT
PUMP PIT
4165 l/sec (66,000 gpm)
4457 l/sec (70,630 gpm)
1
LIME
FAST MIX TANKS (3)
FERRIC SULFATE
FLOCCULATOR TANKS (3)
FLOCCULATOR TANKS (3)
CLARIFIERS (3) 41m (135') DIA. RISE RATE=0.56 l/sec/m2 (0.8 gpm/ft2)
CLARIFIERS (3) 41m (135') DIA. RISE RATE=0.56 l/sec/m2 (0.8 gpm/ft2)
3
TREATED RIVER WATER AS MAKE-UP AVG. FLOW=79 l/sec (1250 gpm)
HOT WELL
COLD WELL
COOLING TOWERS
VACUUM FILTERS (4)
SLUDGE DISPOSAL
MAKE-UP TO FUME SCRUBBER SYSTEM AT PICKLER & NON-CONTACT COOLING WATER ELSEWHERE 48 l/sec (760 gpm)
2
TO RECEIVING STREAM 26.5 l/sec (420 gpm)

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT FORMING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwn. 3/26/79

FIGURE VII-25


SCALE BREAKERS & ROUGHING STANDS *1,2 & 3
TABLE ROLLS SCALE BREAKERS & ROUGHING STANDS *3,4 & 5
SERVICE WATER FEED
5
FINISHING STANDS *1,2,3 & 4
RUNOUT TABLES & FINISHING STANDS *5 & 6
COILERS 1,2 & 5
RUNOUT TABLES
NON-CONTACT COOLING
SCALE PIT *1
SCALE PIT *2
SCALE PIT *3a
SCALE PIT *3b
SCALE PIT *4a
SCALE PIT *4b
1
2
3
1716 l/SEC. (27,200 GPM)
1262 l/SEC (20,000 GPM)
2804 l/SEC. (44,450 GPM)
SKIMMER OIL
MIXER
41 -5b
42 -4b
43 -4a
OIL SEPARATOR
WASTE OIL
CLARIFIER (4)
1262 l/SEC. (20,000 GPM)
TO RECEIVING STREAM 4067 l/SEC. (64,450 GPM)
VACUUM FILTERS
SOLIDS TO DISPOSAL
△ SAMPLE POINT

PROCESS: HOT FORMING-FLAT-HOT STRIP & SHEET

PLANT: M-2

PRODUCTION: 9977 METRIC TONS OF STEEL/DAY (11,000 TONS OF STEEL/DAY)

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

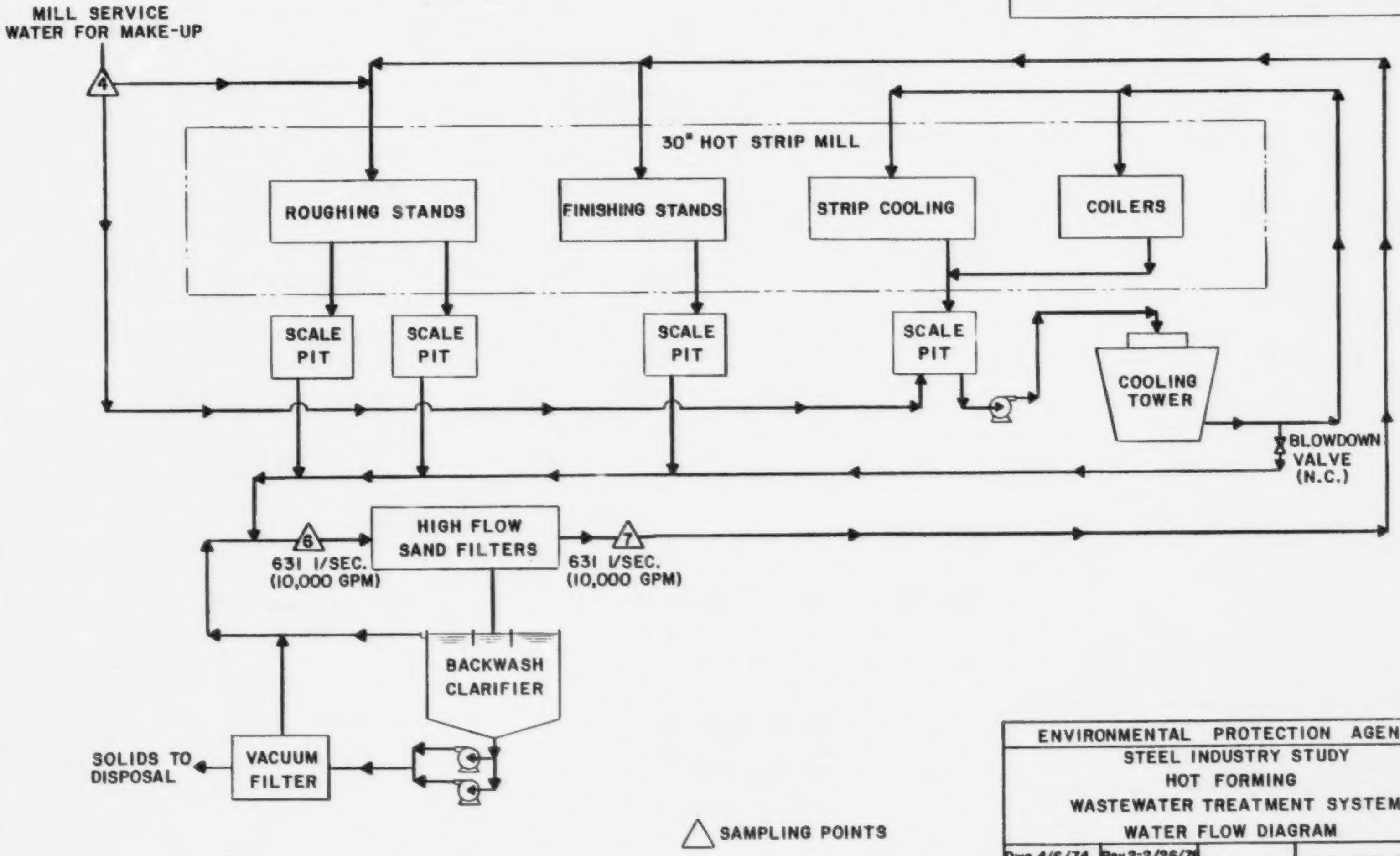
Dwg. 3/21/74
Rev.2-2/20/76

FIGURE VII-26

PROCESS: HOT FORMING-FLAT-HOT STRIP & SHEET

PLANT: N-2

PRODUCTION: 1796 METRIC TONS OF STEEL/DAY (1980 TONS OF STEEL/DAY)


MILL SERVICE WATER FOR MAKE-UP
4
30" HOT STRIP MILL
ROUGHING STANDS
FINISHING STANDS
STRIP COOLING
COILERS
SCALE PIT
SCALE PIT
SCALE PIT
SCALE PIT
COOLING TOWER
BLOWDOWN VALVE (N.C.)
6
631 l/SEC. (10,000 GPM)
HIGH FLOW SAND FILTERS
7
631 l/SEC. (10,000 GPM)
BACKWASH CLARIFIER
VACUUM FILTER
SOLIDS TO DISPOSAL
SAMPLING POINTS

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

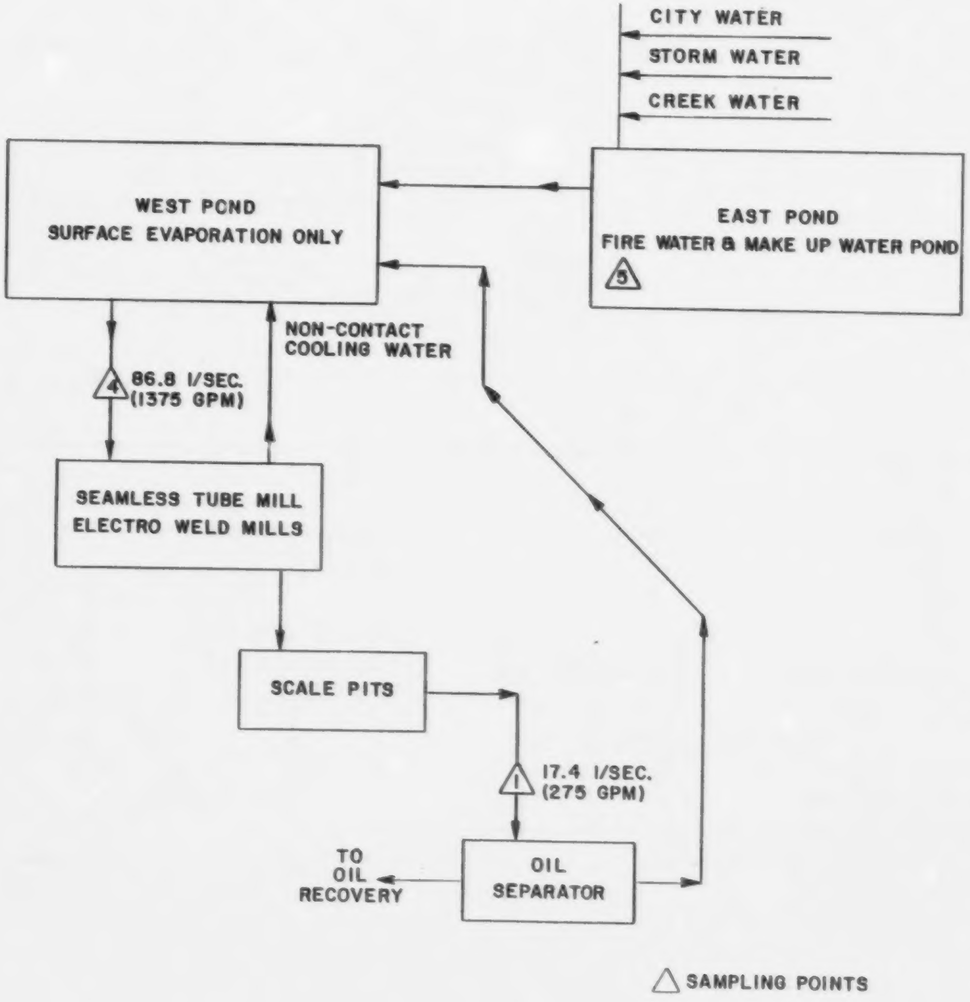
Dwg.4/6/74 Rev.2-2/26/76
Rev.1-2/20/76

FIGURE VII-27

PROCESS: PIPE & TUBES

PLANT: GG-2

PRODUCTION: 211 METRIC TONS OF STEEL/DAY
(233 TONS OF STEEL/DAY)

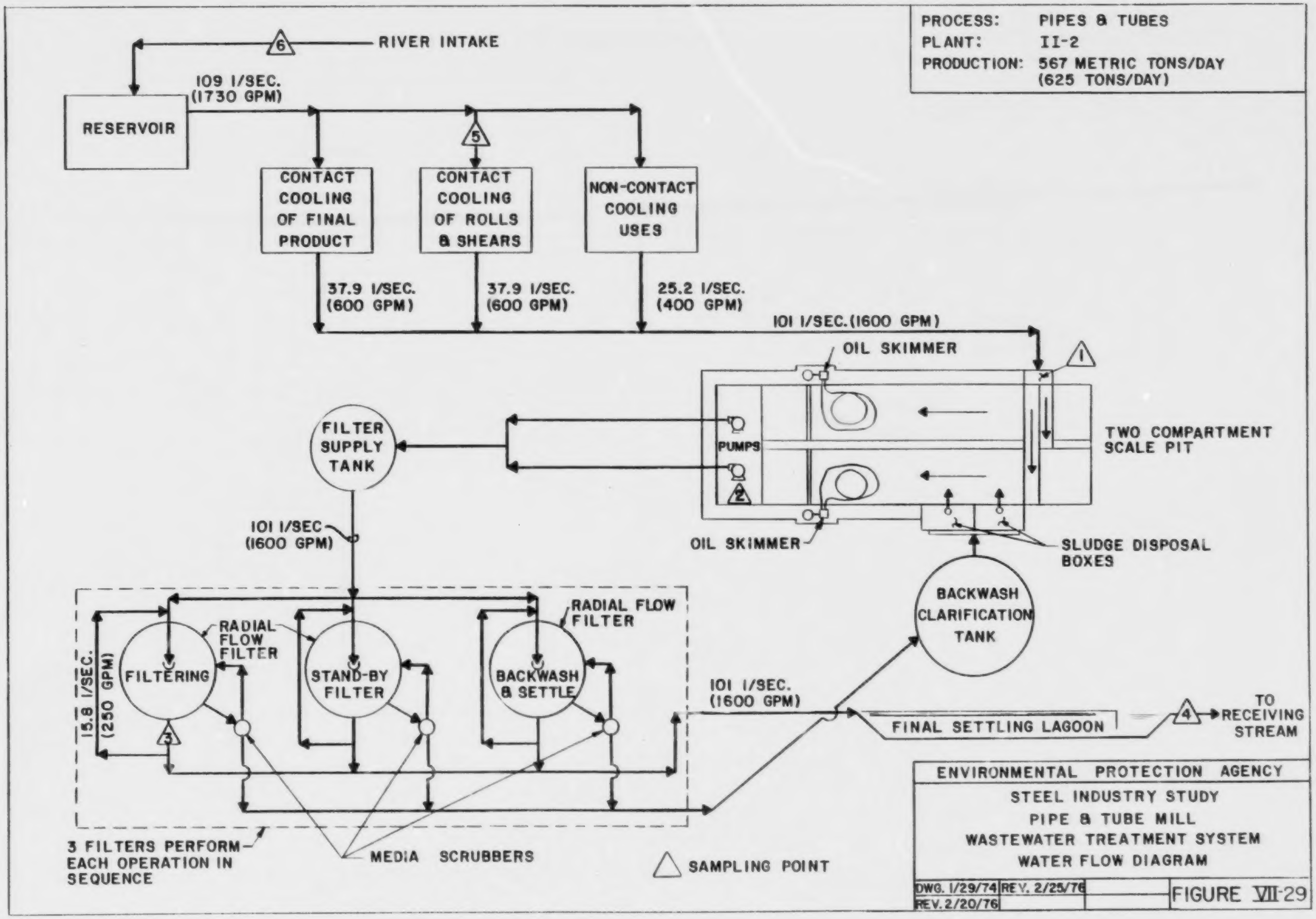

CITY WATER
STORM WATER
CREEK WATER
WEST POND
SURFACE EVAPORATION ONLY
EAST POND
FIRE WATER & MAKE UP WATER POND
5
NON-CONTACT
COOLING WATER
4
86.8 l/SEC.
(1375 GPM)
SEAMLESS TUBE MILL
ELECTRO WELD MILLS
SCALE PITS
1
17.4 l/SEC.
(275 GPM)
TO
OIL
RECOVERY
OIL
SEPARATOR
△ SAMPLING POINTS

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
PIPE & TUBE MILL
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwg. 5/6/74 Rev.2-2/26/76
Rev.1-2/20/76

FIGURE VII-28



RIVER INTAKE
6
RESERVOIR
109 l/SEC.
(1730 GPM)
5
CONTACT COOLING OF FINAL PRODUCT
CONTACT COOLING OF ROLLS & SHEARS
NON-CONTACT COOLING USES
37.9 l/SEC.
(600 GPM)
37.9 l/SEC.
(600 GPM)
25.2 l/SEC.
(400 GPM)
101 l/SEC.(1600 GPM)
OIL SKIMMER
1
PUMPS
2
TWO COMPARTMENT SCALE PIT
OIL SKIMMER
SLUDGE DISPOSAL BOXES
FILTER SUPPLY TANK
101 l/SEC
(1600 GPM)
BACKWASH CLARIFICATION TANK
RADIAL FLOW FILTER
RADIAL FLOW FILTER
15.8 l/SEC.
(250 GPM)
FILTERING
3
STAND-BY FILTER
BACKWASH & SETTLE
101 l/SEC.
(1600 GPM)
FINAL SETTLING LAGOON
4
TO RECEIVING STREAM
3 FILTERS PERFORM EACH OPERATION IN SEQUENCE
MEDIA SCRUBBERS
SAMPLING POINT
DWG. 1/29/74
REV. 2/25/76
REV. 2/20/76

PROCESS: PIPES & TUBES
PLANT: II-2
PRODUCTION: 567 METRIC TONS/DAY
(625 TONS/DAY)

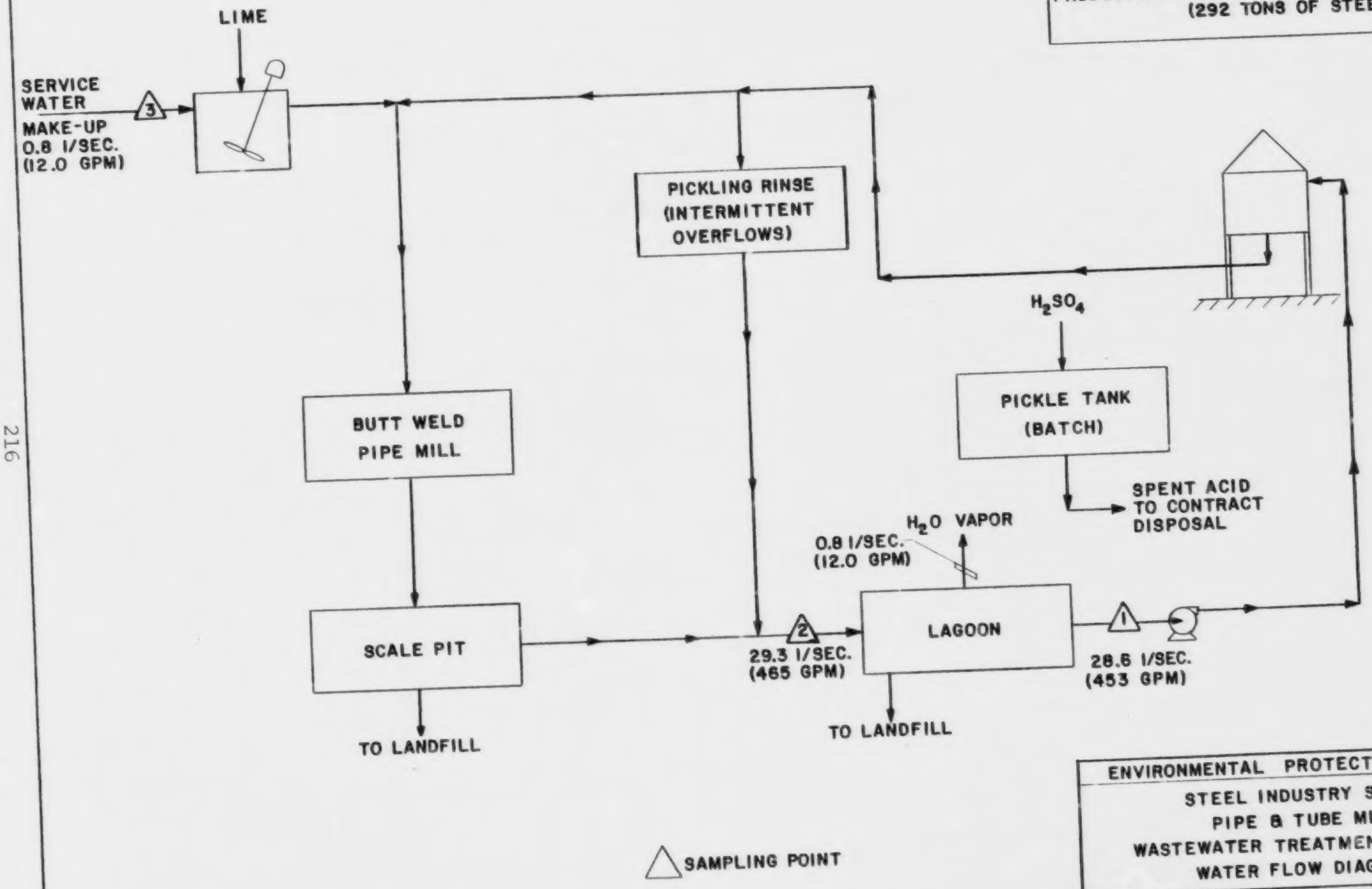
ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
PIPE & TUBE MILL
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-29

PROCESS: PIPE & TUBES-HOT WORKED

PLANT: JJ-2

PRODUCTION: 265 METRIC TONS OF STEEL/DAY
(292 TONS OF STEEL/DAY)

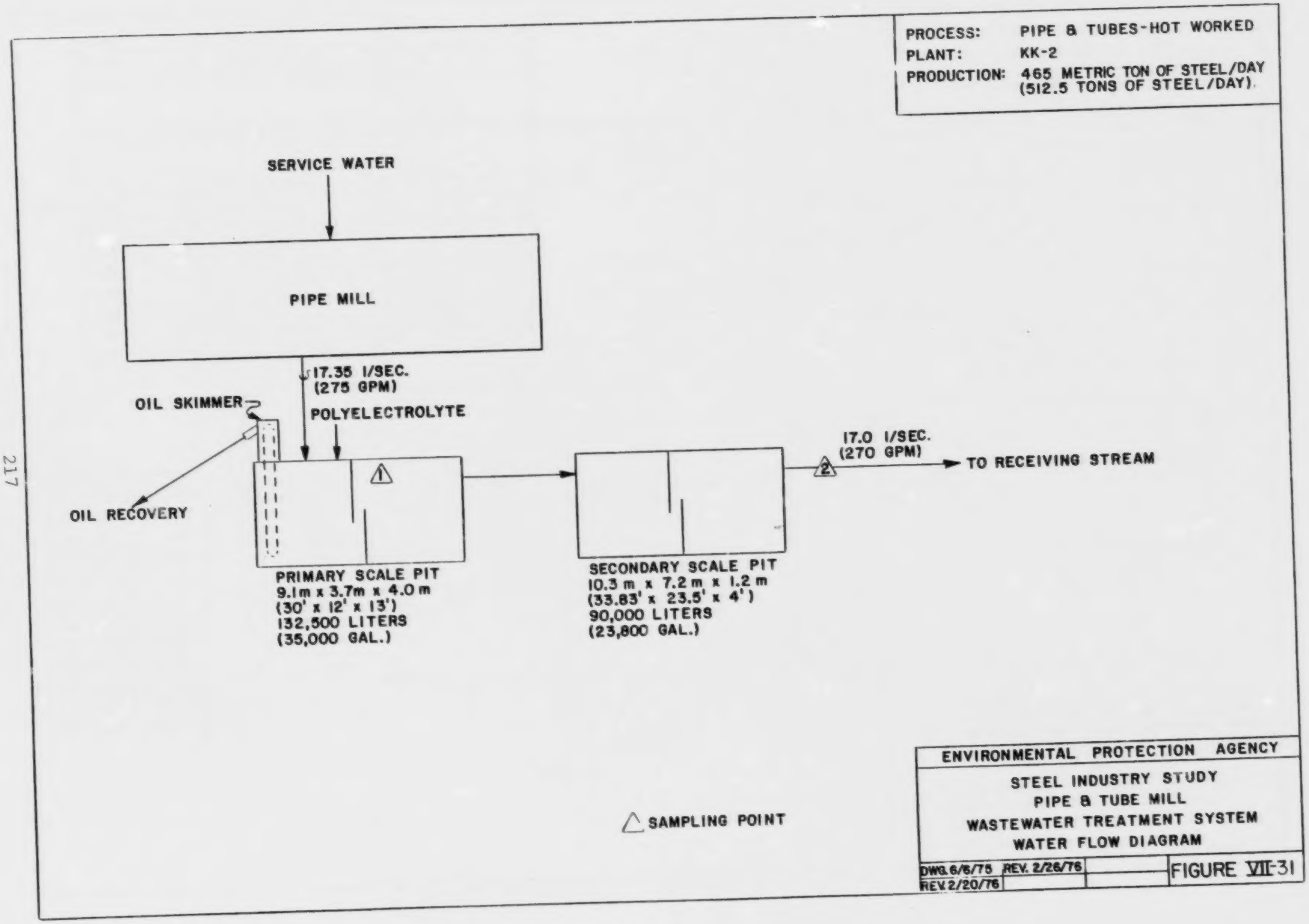

LIME
SERVICE WATER
MAKE-UP
0.8 l/SEC.
(12.0 GPM)
3
PICKLING RINSE (INTERMITTENT OVERFLOWS)
BUTT WELD PIPE MILL
SCALE PIT
TO LANDFILL
H_2SO_4
PICKLE TANK (BATCH)
SPENT ACID TO CONTRACT DISPOSAL
H_2O VAPOR
0.8 l/SEC.
(12.0 GPM)
2
29.3 l/SEC.
(465 GPM)
LAGOON
TO LANDFILL
1
28.6 l/SEC.
(453 GPM)
SAMPLING POINT

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
PIPE & TUBE MILL
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

DWG. 6-6-75 REV. 2-25-76
REV. 2-20-76

FIGURE VII-30


SERVICE WATER
PIPE MILL
17.35 l/SEC.
(275 GPM)
POLYELECTROLYTE
OIL SKIMMER
OIL RECOVERY
1
PRIMARY SCALE PIT
9.1m x 3.7m x 4.0 m
(30' x 12' x 13')
132,500 LITERS
(35,000 GAL.)
SECONDARY SCALE PIT
10.3 m x 7.2 m x 1.2 m
(33.83' x 23.5' x 4')
90,000 LITERS
(23,800 GAL.)
2
17.0 l/SEC.
(270 GPM)
TO RECEIVING STREAM
△ SAMPLING POINT

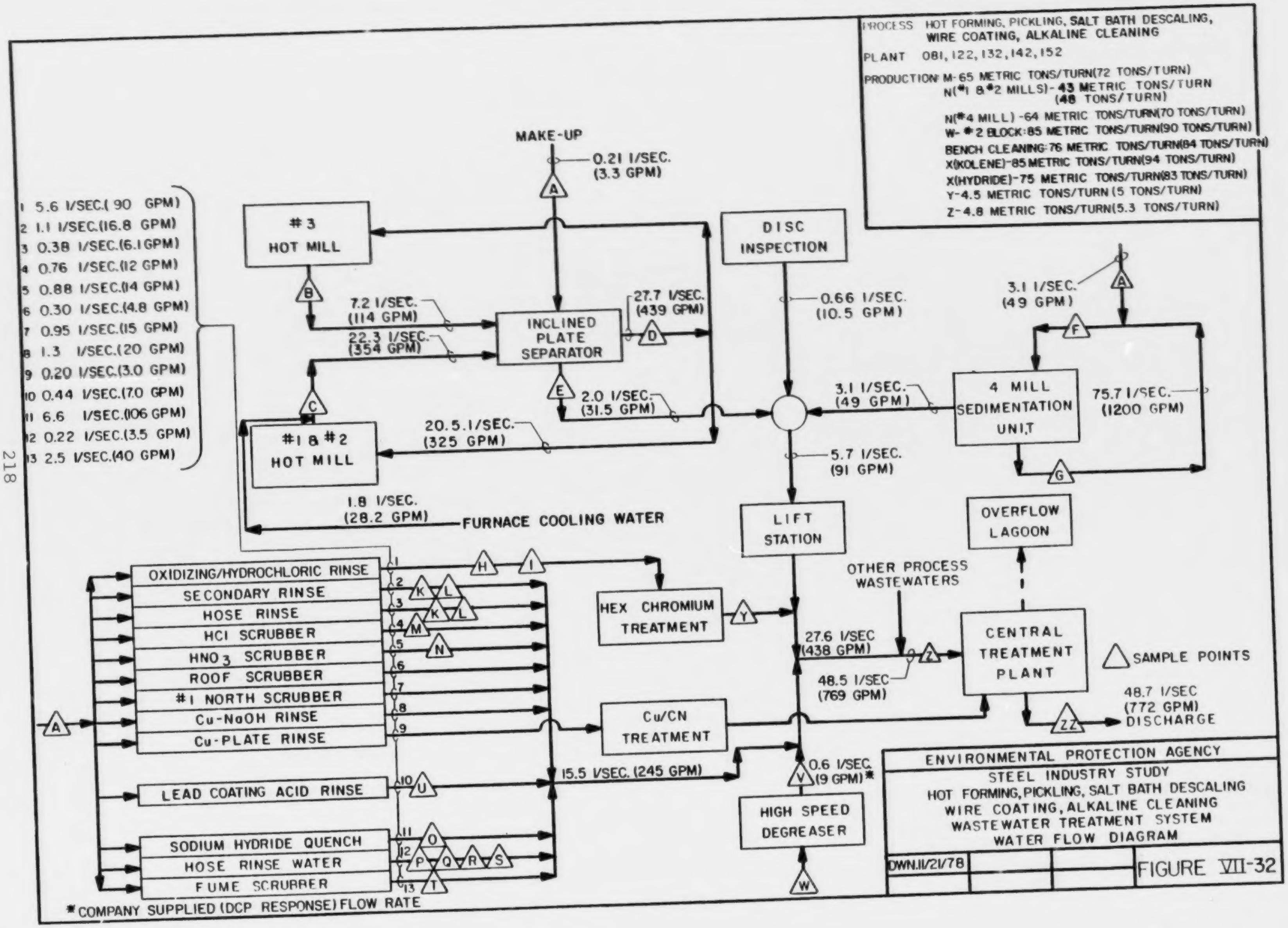
PROCESS: PIPE & TUBES-HOT WORKED
PLANT: KK-2
PRODUCTION: 465 METRIC TON OF STEEL/DAY
(512.5 TONS OF STEEL/DAY).

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
PIPE & TUBE MILL
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

DWG. 6/6/75 REV. 2/26/76
REV. 2/20/76

FIGURE VII-31


MAKE-UP
0.21 l/SEC.
(3.3 GPM)
A
#3 HOT MILL
B
7.2 l/SEC.
(114 GPM)
22.3 l/SEC.
(354 GPM)
INCLINED PLATE SEPARATOR
27.7 l/SEC.
(439 GPM)
D
E
2.0 l/SEC.
(31.5 GPM)
C
#1 & #2 HOT MILL
20.5 l/SEC.
(325 GPM)
1.8 l/SEC.
(28.2 GPM)
FURNACE COOLING WATER
DISC INSPECTION
0.66 l/SEC.
(10.5 GPM)
3.1 l/SEC.
(49 GPM)
4 MILL SEDIMENTATION UNIT
F
G
75.7 l/SEC.
(1200 GPM)
5.7 l/SEC.
(91 GPM)
LIFT STATION
OVERFLOW LAGOON
OTHER PROCESS WASTEWATERS
Z
CENTRAL TREATMENT PLANT
SAMPLE POINTS
27.6 l/SEC
(438 GPM)
48.5 l/SEC
(769 GPM)
ZZ
48.7 l/SEC
(772 GPM)
DISCHARGE
HEX CHROMIUM TREATMENT
Y
Cu/CN TREATMENT
15.5 l/SEC. (245 GPM)
V
0.6 l/SEC.
(9 GPM)*
HIGH SPEED DEGREASER
W
OXIDIZING/HYDROCHLORIC RINSE
SECONDARY RINSE
HOSE RINSE
HCl SCRUBBER
HNO3 SCRUBBER
ROOF SCRUBBER
#1 NORTH SCRUBBER
Cu-NaOH RINSE
Cu-PLATE RINSE
LEAD COATING ACID RINSE
SODIUM HYDRIDE QUENCH
HOSE RINSE WATER
FUME SCRUBBER
H
I
K
L
M
N
U
O
P
Q
R
S
T
1
2
3
4
5
6
7
8
9
10
11
12
13
1 5.6 l/SEC.(90 GPM)
2 1.1 l/SEC.(16.8 GPM)
3 0.38 l/SEC.(6.1 GPM)
4 0.76 l/SEC.(12 GPM)
5 0.88 l/SEC.(14 GPM)
6 0.30 l/SEC.(4.8 GPM)
7 0.95 l/SEC.(15 GPM)
8 1.3 l/SEC.(20 GPM)
9 0.20 l/SEC.(3.0 GPM)
10 0.44 l/SEC.(7.0 GPM)
11 6.6 l/SEC.(106 GPM)
12 0.22 l/SEC.(3.5 GPM)
13 2.5 l/SEC.(40 GPM)

PROCESS HOT FORMING, PICKLING, SALT BATH DESCALING, WIRE COATING, ALKALINE CLEANING

PLANT 081, 122, 132, 142, 152

PRODUCTION: M-65 METRIC TONS/TURN(72 TONS/TURN)
N(#1 & #2 MILLS)-43 METRIC TONS/TURN (48 TONS/TURN)
N(#4 MILL)-64 METRIC TONS/TURN(70 TONS/TURN)
W-#2 BLOCK:85 METRIC TONS/TURN(90 TONS/TURN)
BENCH CLEANING:76 METRIC TONS/TURN(84 TONS/TURN)
X(KOLENE)-85 METRIC TONS/TURN(94 TONS/TURN)
X(HYDRIDE)-75 METRIC TONS/TURN(83 TONS/TURN)
Y-4.5 METRIC TONS/TURN (5 TONS/TURN)
Z-4.8 METRIC TONS/TURN(5.3 TONS/TURN)

*COMPANY SUPPLIED (DCP RESPONSE) FLOW RATE

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT FORMING, PICKLING, SALT BATH DESCALING
WIRE COATING, ALKALINE CLEANING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

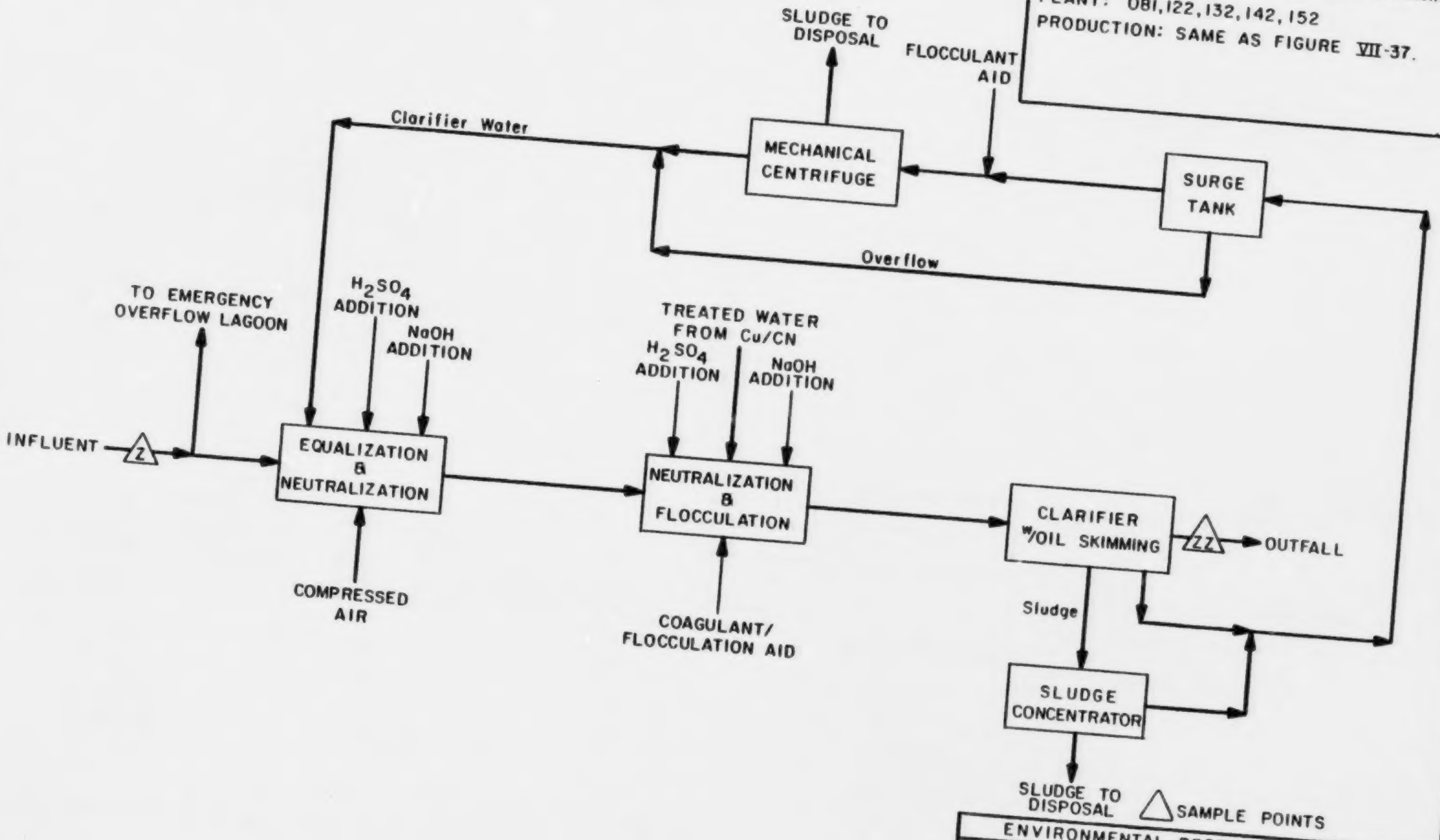
DWN.11/21/78

FIGURE VII-32

PROCESS: HOT FORMING, PICKLING, SCALE REMOVAL, WIRE COATING, ALKALINE CLEANING

PLANT: 081, 122, 132, 142, 152

PRODUCTION: SAME AS FIGURE VII-37.


SLUDGE TO DISPOSAL
FLOCCULANT AID
Clarifier Water
MECHANICAL CENTRIFUGE
SURGE TANK
Overflow
TO EMERGENCY OVERFLOW LAGOON
H_2SO_4 ADDITION
NaOH ADDITION
TREATED WATER FROM Cu/CN
H_2SO_4 ADDITION
NaOH ADDITION
INFLUENT
Z
EQUALIZATION & NEUTRALIZATION
NEUTRALIZATION & FLOCCULATION
CLARIFIER W/OIL SKIMMING
ZZ
OUTFALL
COMPRESSED AIR
COAGULANT/ FLOCCULATION AID
Sludge
SLUDGE CONCENTRATOR
SLUDGE TO DISPOSAL

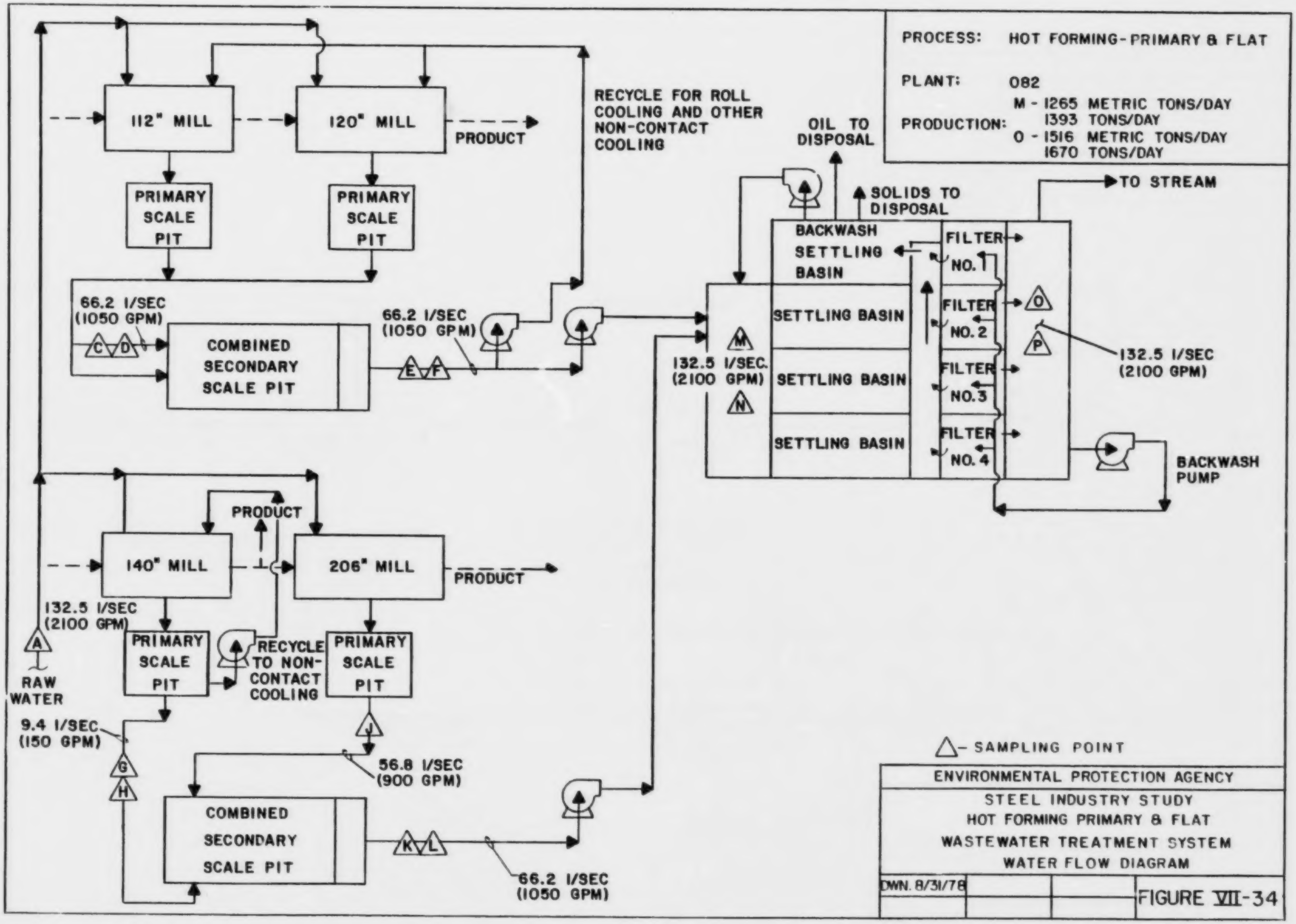
△ SAMPLE POINTS

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING, PICKLING, SCALE REMOVAL,
WIRE COATING, ALKALINE CLEANING
CENTRAL TREATMENT PLANT
WATER FLOW DIAGRAM

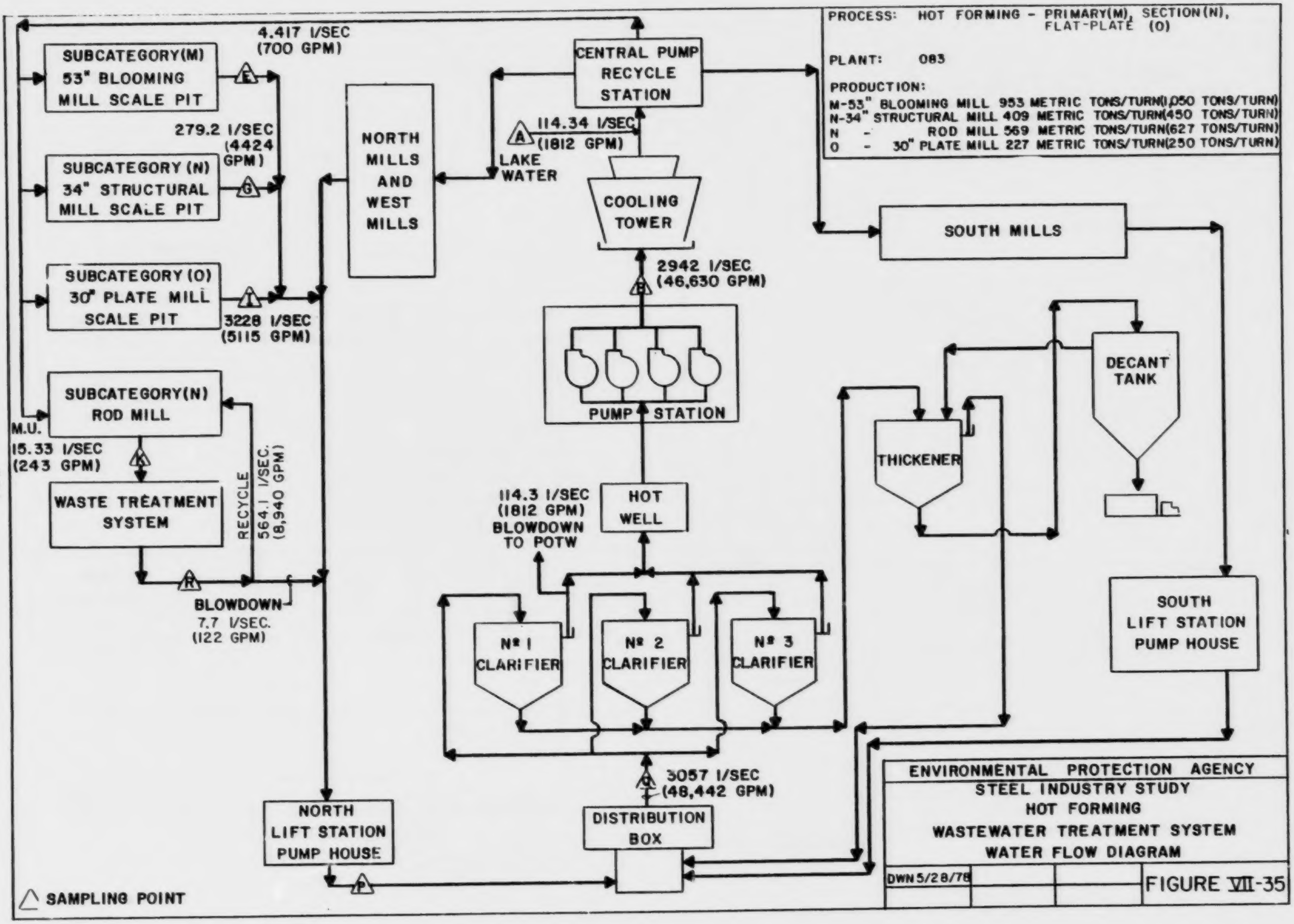
DWN. 11/21/78

FIGURE VII-33


PROCESS: HOT FORMING-PRIMARY & FLAT
PLANT: 082
PRODUCTION: M - 1265 METRIC TONS/DAY
1393 TONS/DAY
O - 1516 METRIC TONS/DAY
1670 TONS/DAY
112" MILL
120" MILL
PRODUCT
PRIMARY SCALE PIT
PRIMARY SCALE PIT
RECYCLE FOR ROLL COOLING AND OTHER NON-CONTACT COOLING
66.2 l/SEC (1050 GPM)
C
D
COMBINED SECONDARY SCALE PIT
66.2 l/SEC (1050 GPM)
E
F
OIL TO DISPOSAL
SOLIDS TO DISPOSAL
TO STREAM
BACKWASH SETTLING BASIN
SETTLING BASIN
SETTLING BASIN
SETTLING BASIN
FILTER NO. 1
FILTER NO. 2
FILTER NO. 3
FILTER NO. 4
M
N
132.5 l/SEC. (2100 GPM)
O
P
132.5 l/SEC (2100 GPM)
BACKWASH PUMP
140" MILL
206" MILL
PRODUCT
PRODUCT
132.5 l/SEC (2100 GPM)
A
RAW WATER
PRIMARY SCALE PIT
RECYCLE TO NON-CONTACT COOLING
PRIMARY SCALE PIT
J
9.4 l/SEC (150 GPM)
G
H
56.8 l/SEC (900 GPM)
COMBINED SECONDARY SCALE PIT
K
L
66.2 l/SEC (1050 GPM)
△- SAMPLING POINT
DWN. 8/31/78

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT FORMING PRIMARY & FLAT
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-34


SUBCATEGORY(M) 53" BLOOMING MILL SCALE PIT
4.417 l/SEC (700 GPM)
E
SUBCATEGORY (N) 34" STRUCTURAL MILL SCALE PIT
279.2 l/SEC (4424 GPM)
G
SUBCATEGORY (O) 30" PLATE MILL SCALE PIT
3228 l/SEC (5115 GPM)
I
SUBCATEGORY(N) ROD MILL
M.U.
15.33 l/SEC (243 GPM)
K
WASTE TREATMENT SYSTEM
RECYCLE 564.1 l/SEC. (8,940 GPM)
R
BLOWDOWN 7.7 l/SEC. (122 GPM)
NORTH MILLS AND WEST MILLS
NORTH LIFT STATION PUMP HOUSE
P
CENTRAL PUMP RECYCLE STATION
A
114.34 l/SEC (1812 GPM)
LAKE WATER
COOLING TOWER
2942 l/SEC (46,630 GPM)
B
PUMP STATION
HOT WELL
114.3 l/SEC (1812 GPM) BLOWDOWN TO POTW
Nº 1 CLARIFIER
Nº 2 CLARIFIER
Nº 3 CLARIFIER
Q
3057 l/SEC (48,442 GPM)
DISTRIBUTION BOX
SOUTH MILLS
THICKENER
DECANT TANK
SOUTH LIFT STATION PUMP HOUSE
△ SAMPLING POINT

PROCESS: HOT FORMING - PRIMARY(M), SECTION(N), FLAT-PLATE (O)

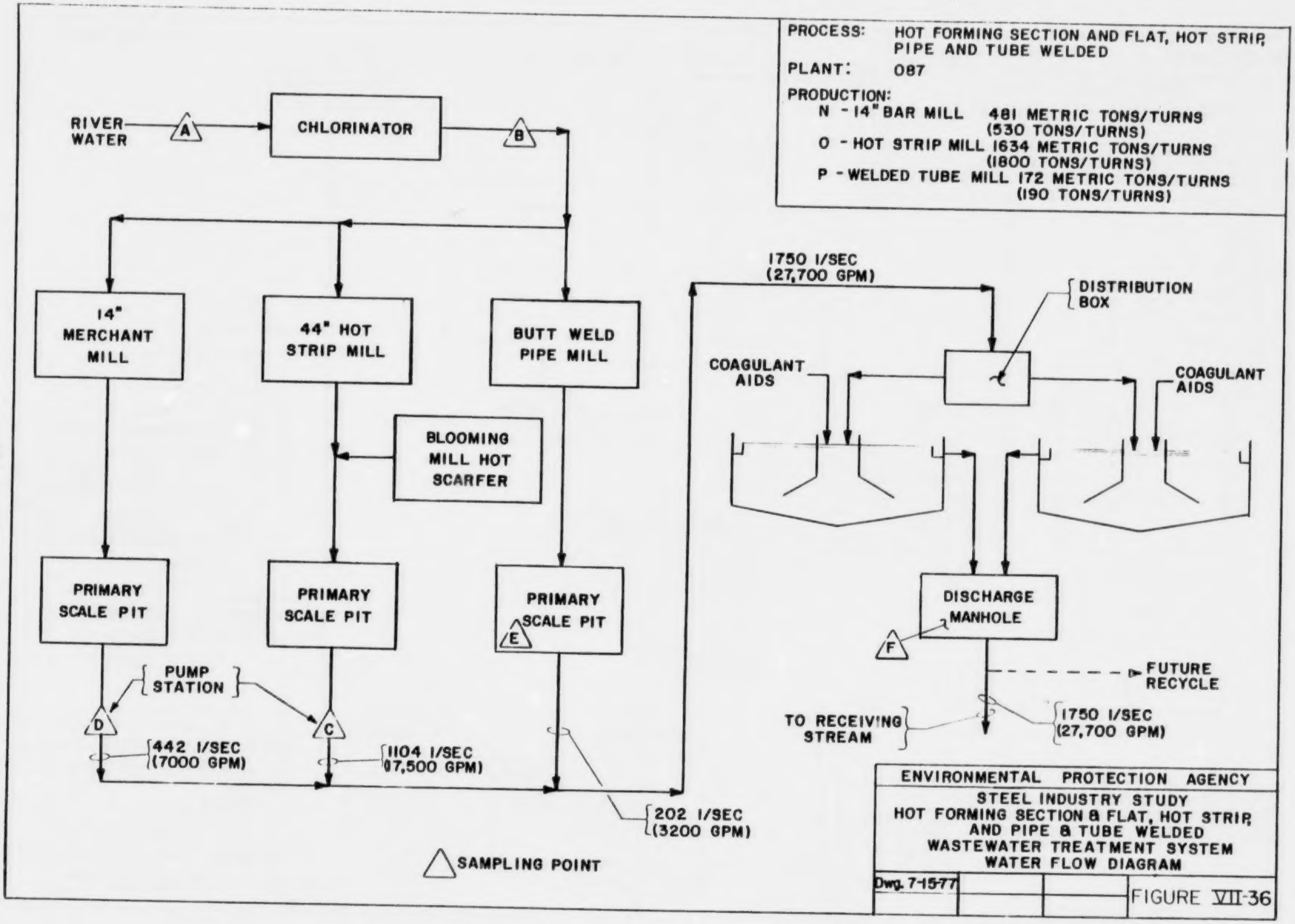
PLANT: 083

PRODUCTION:
M-53" BLOOMING MILL 953 METRIC TONS/TURN(1,050 TONS/TURN)
N-34" STRUCTURAL MILL 409 METRIC TONS/TURN(450 TONS/TURN)
N - ROD MILL 569 METRIC TONS/TURN(627 TONS/TURN)
O - 30" PLATE MILL 227 METRIC TONS/TURN(250 TONS/TURN)

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT FORMING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

DWN 5/28/78

FIGURE VII-35



RIVER WATER
A
CHLORINATOR
B
14" MERCHANT MILL
44" HOT STRIP MILL
BUTT WELD PIPE MILL
BLOOMING MILL HOT SCARFER
PRIMARY SCALE PIT
PRIMARY SCALE PIT
PRIMARY SCALE PIT
E
PUMP STATION
D
C
442 l/SEC (7000 GPM)
1104 l/SEC (17,500 GPM)
202 l/SEC (3200 GPM)
SAMPLING POINT
1750 l/SEC (27,700 GPM)
DISTRIBUTION BOX
COAGULANT AIDS
COAGULANT AIDS
DISCHARGE MANHOLE
F
FUTURE RECYCLE
TO RECEIVING STREAM
1750 l/SEC (27,700 GPM)

PROCESS: HOT FORMING SECTION AND FLAT, HOT STRIP, PIPE AND TUBE WELDED

PLANT: 087

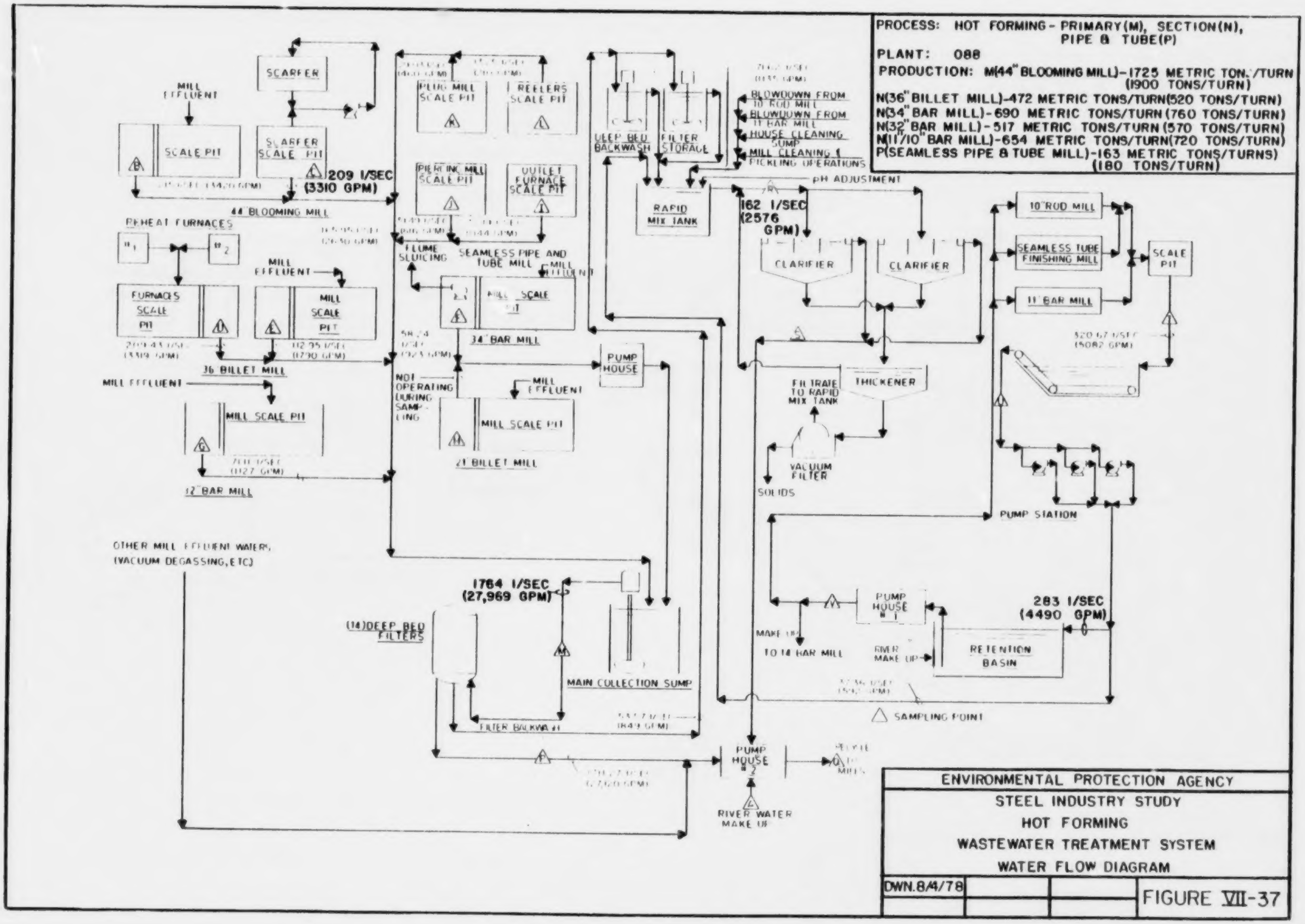
PRODUCTION:
N - 14" BAR MILL 481 METRIC TONS/TURNS (530 TONS/TURNS)
O - HOT STRIP MILL 1634 METRIC TONS/TURNS (1800 TONS/TURNS)
P - WELDED TUBE MILL 172 METRIC TONS/TURNS (190 TONS/TURNS)

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING SECTION & FLAT, HOT STRIP, AND PIPE & TUBE WELDED
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwg. 7-15-77

FIGURE VII-36


MILL EFFLUENT
SCALE PIT
SCARFER
SCARFER SCALE PIT
209 l/SEC (3310 GPM)
44" BLOOMING MILL
REHEAT FURNACES
#1
#2
FURNACES SCALE PIT
MILL EFFLUENT
MILL SCALE PIT
(3319 GPM)
112.95 l/SEC (1790 GPM)
36" BILLET MILL
MILL EFFLUENT
MILL SCALE PIT
(1127 GPM)
12" BAR MILL
PLUG MILL SCALE PIT
REELERS SCALE PIT
PIERCING MILL SCALE PIT
OUTLET FURNACE SCALE PIT
FLUME SLUICING
SEAMLESS PIPE AND TUBE MILL
MILL EFFLUENT
MILL SCALE PIT
34" BAR MILL
NOT OPERATING DURING SAMPLING
MILL EFFLUENT
MILL SCALE PIT
21" BILLET MILL
PUMP HOUSE
OTHER MILL EFFLUENT WATERS, (VACUUM DEGASSING, ETC)
DEEP BED BACKWASH
FILTER STORAGE
BLOWDOWN FROM 10" ROD MILL
BLOWDOWN FROM 11" BAR MILL
HOUSE CLEANING SUMP
MILL CLEANING & PICKLING OPERATIONS
pH ADJUSTMENT
RAPID MIX TANK
162 l/SEC (2576 GPM)
CLARIFIER
CLARIFIER
THICKENER
FILTRATE TO RAPID MIX TANK
VACUUM FILTER
SOLIDS
10" ROD MILL
SEAMLESS TUBE FINISHING MILL
11" BAR MILL
SCALE PIT
320.67 l/SEC (5082 GPM)
PUMP STATION
1764 l/SEC (27,969 GPM)
(14) DEEP BED FILTERS
MAIN COLLECTION SUMP
FILTER BACKWASH
(849 GPM)
PUMP HOUSE #2
RECYCLE TO MILLS
RIVER WATER MAKE UP
PUMP HOUSE #1
MAKE UP TO 14" BAR MILL
RIVER MAKE UP
RETENTION BASIN
283 l/SEC (4490 GPM)
SAMPLING POINT

PROCESS: HOT FORMING - PRIMARY(M), SECTION(N), PIPE & TUBE(P)

PLANT: 088

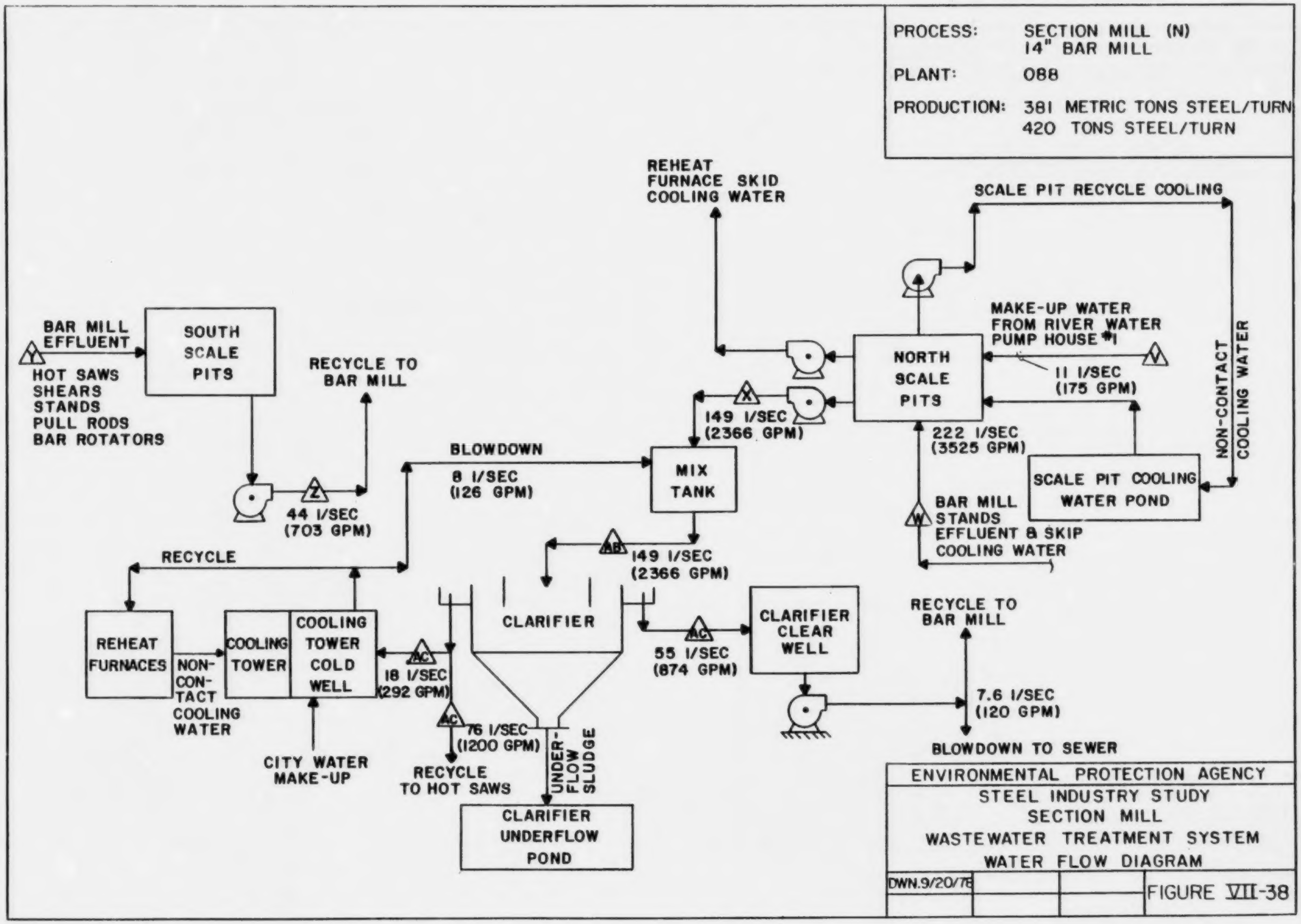
PRODUCTION: M(44" BLOOMING MILL)-1725 METRIC TONS/TURN (1900 TONS/TURN)

N(36" BILLET MILL)-472 METRIC TONS/TURN(520 TONS/TURN)
N(34" BAR MILL)-690 METRIC TONS/TURN (760 TONS/TURN)
N(32" BAR MILL)-517 METRIC TONS/TURN (570 TONS/TURN)
N(11"/10" BAR MILL)-654 METRIC TONS/TURN(720 TONS/TURN)
P(SEAMLESS PIPE & TUBE MILL)-163 METRIC TONS/TURNS) (180 TONS/TURN)

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT FORMING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

DWN. 8/4/78

FIGURE VII-37


BAR MILL EFFLUENT
Y
HOT SAWS
SHEARS
STANDS
PULL RODS
BAR ROTATORS
SOUTH SCALE PITS
Z
44 l/SEC (703 GPM)
RECYCLE TO BAR MILL
BLOWDOWN
8 l/SEC (126 GPM)
RECYCLE
REHEAT FURNACES
NON-CONTACT COOLING WATER
COOLING TOWER
COOLING TOWER COLD WELL
CITY WATER MAKE-UP
AC
18 l/SEC (292 GPM)
AC
76 l/SEC (1200 GPM)
RECYCLE TO HOT SAWS
CLARIFIER
UNDER-FLOW SLUDGE
CLARIFIER UNDERFLOW POND
MIX TANK
AB
149 l/SEC (2366 GPM)
REHEAT FURNACE SKID COOLING WATER
X
149 l/SEC (2366 GPM)
AC
55 l/SEC (874 GPM)
CLARIFIER CLEAR WELL
7.6 l/SEC (120 GPM)
RECYCLE TO BAR MILL
BLOWDOWN TO SEWER
NORTH SCALE PITS
SCALE PIT RECYCLE COOLING
MAKE-UP WATER FROM RIVER WATER PUMP HOUSE #1
V
11 l/SEC (175 GPM)
222 l/SEC (3525 GPM)
W
BAR MILL STANDS EFFLUENT & SKIP COOLING WATER
SCALE PIT COOLING WATER POND
NON-CONTACT COOLING WATER

PROCESS: SECTION MILL (N)
14" BAR MILL

PLANT: 088

PRODUCTION: 381 METRIC TONS STEEL/TURN
420 TONS STEEL/TURN

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
SECTION MILL
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

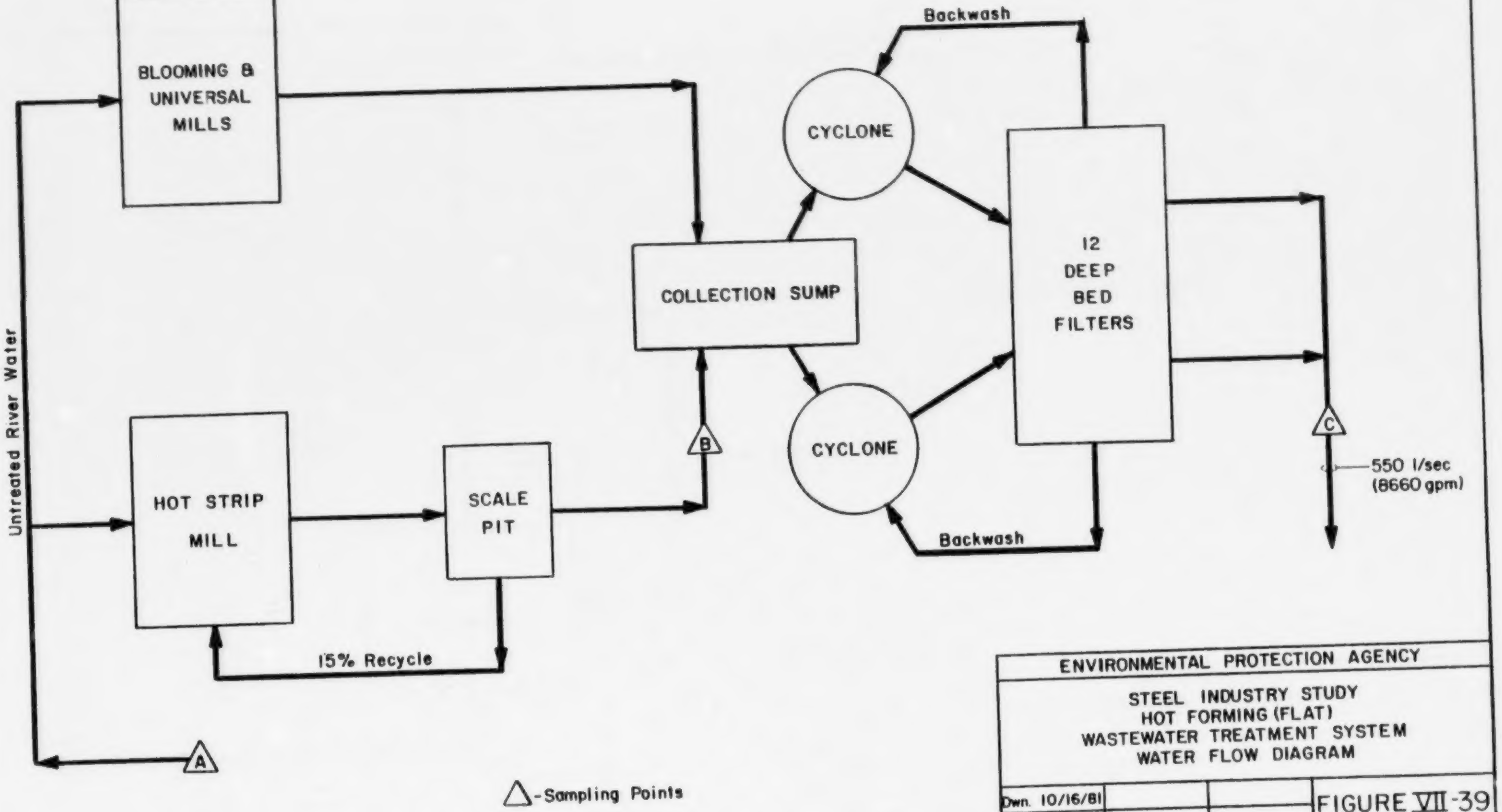
DWN.9/20/78

FIGURE VII-38

PROCESS: Hot Forming-Hot Strip Mill

PLANT: 281

PRODUCTION: 660 Metric Tons Steel/Day
(730 Tons/Turn)

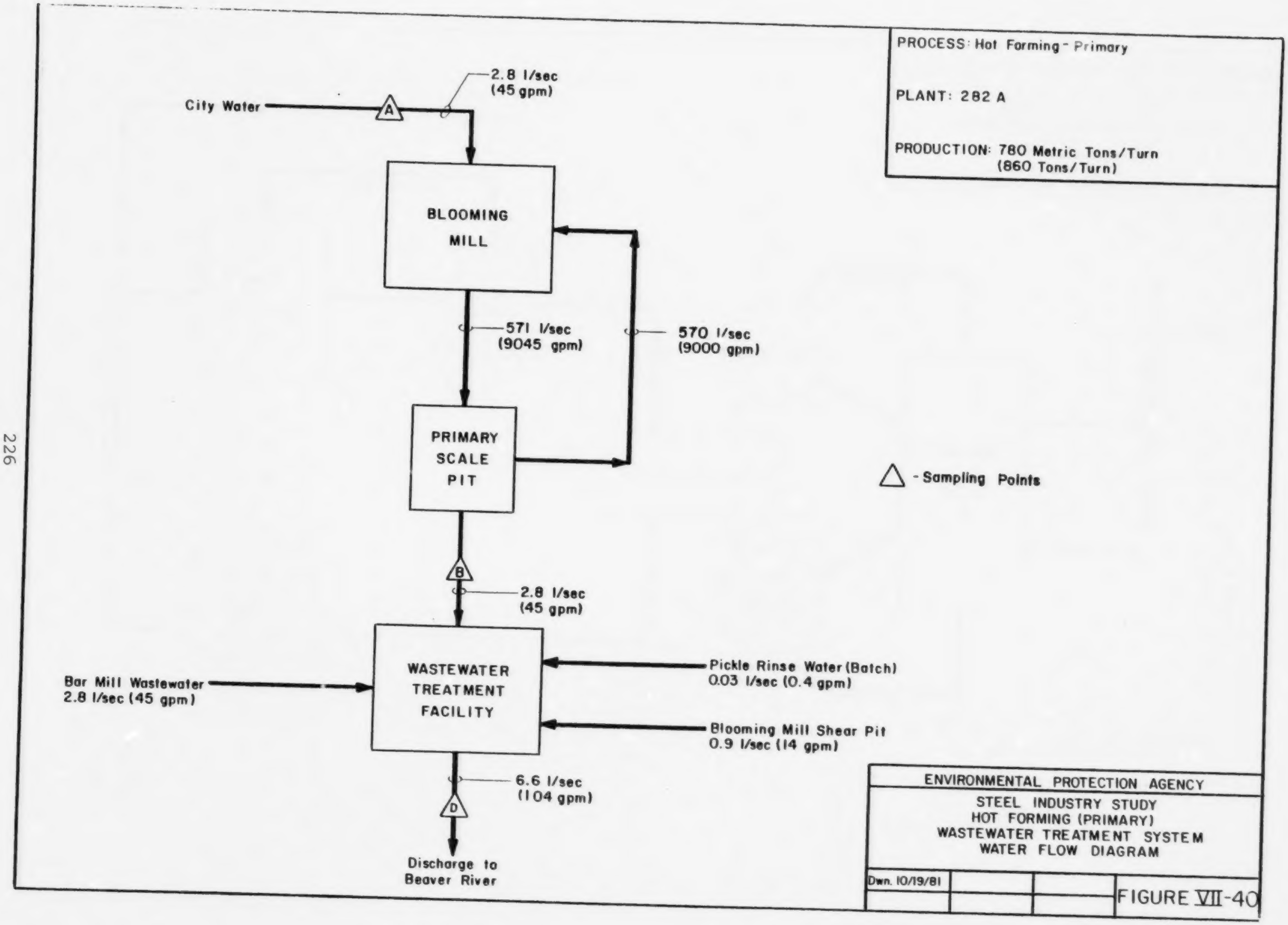

BLOOMING & UNIVERSAL MILLS
HOT STRIP MILL
SCALE PIT
15% Recycle
Untreated River Water
A
B
C
COLLECTION SUMP
CYCLONE
CYCLONE
Backwash
Backwash
12 DEEP BED FILTERS
550 l/sec (8660 gpm)
△-Sampling Points

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING (FLAT)
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwn. 10/16/81

FIGURE VII-39


City Water
A
2.8 l/sec (45 gpm)
BLOOMING MILL
571 l/sec (9045 gpm)
570 l/sec (9000 gpm)
PRIMARY SCALE PIT
B
2.8 l/sec (45 gpm)
Bar Mill Wastewater 2.8 l/sec (45 gpm)
WASTEWATER TREATMENT FACILITY
Pickle Rinse Water (Batch) 0.03 l/sec (0.4 gpm)
Blooming Mill Shear Pit 0.9 l/sec (14 gpm)
6.6 l/sec (104 gpm)
D
Discharge to Beaver River
△ - Sampling Points

PROCESS: Hot Forming - Primary

PLANT: 282 A

PRODUCTION: 780 Metric Tons/Turn
(860 Tons/Turn)

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING (PRIMARY)
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

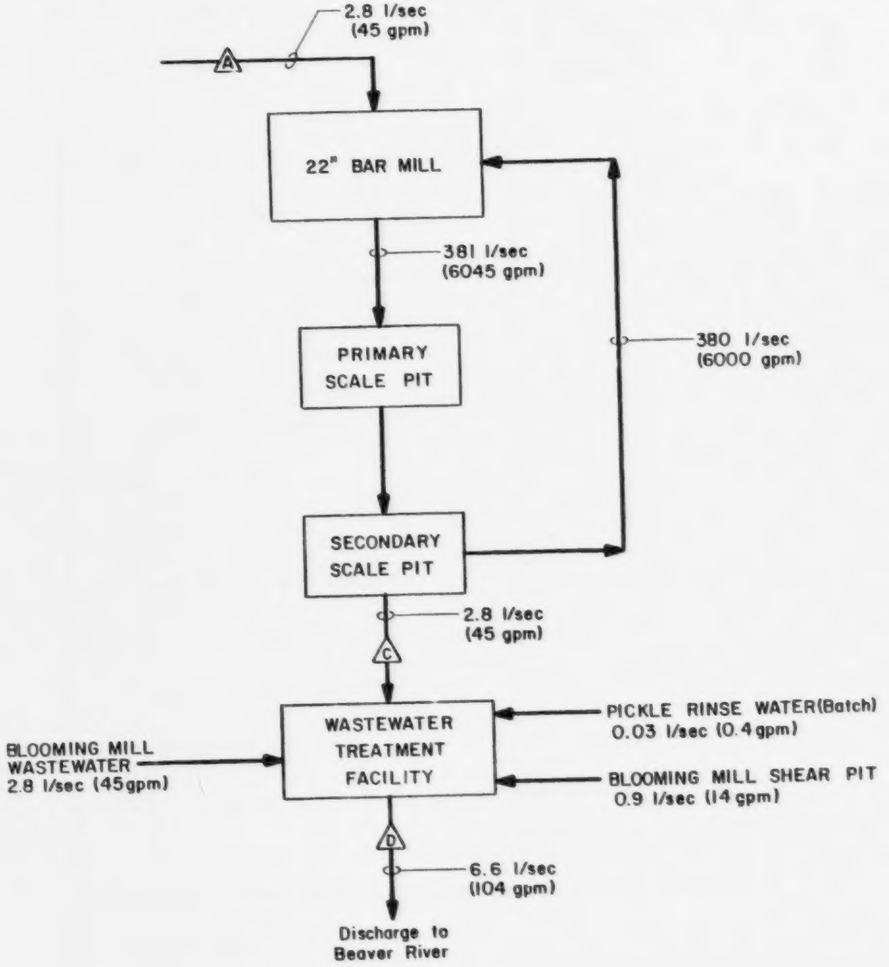
Dwn. 10/19/81

FIGURE VII-40

PROCESS: Hot Forming - Section

PLANT: 282B

PRODUCTION: 410 Metric Tons/Turn
(450 Tons/Turn)



2.8 l/sec (45 gpm)
A
22" BAR MILL
381 l/sec (6045 gpm)
PRIMARY SCALE PIT
380 l/sec (6000 gpm)
SECONDARY SCALE PIT
2.8 l/sec (45 gpm)
C
BLOOMING MILL WASTEWATER 2.8 l/sec (45gpm)
WASTEWATER TREATMENT FACILITY
PICKLE RINSE WATER(Batch) 0.03 l/sec (0.4 gpm)
BLOOMING MILL SHEAR PIT 0.9 l/sec (14 gpm)
D
6.6 l/sec (104 gpm)
Discharge to Beaver River

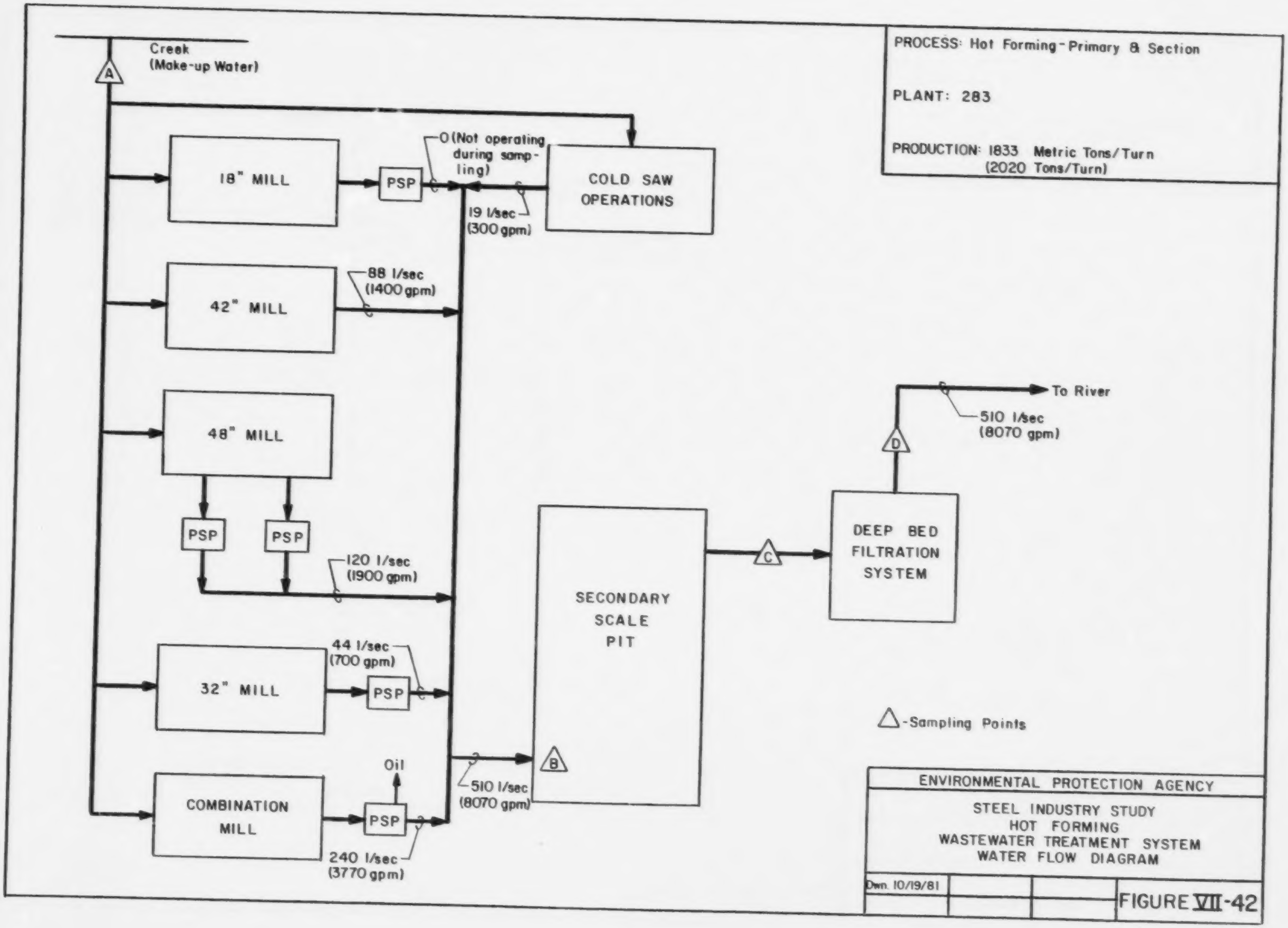
△ - Sampling Points

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING (SECTION)
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwn. 10/16/81

FIGURE VII-41


Creek
(Make-up Water)
A
18" MILL
PSP
0 (Not operating during samp-ling)
19 l/sec
(300 gpm)
COLD SAW OPERATIONS
42" MILL
88 l/sec
(1400 gpm)
48" MILL
PSP
PSP
120 l/sec
(1900 gpm)
32" MILL
44 l/sec
(700 gpm)
PSP
COMBINATION MILL
Oil
PSP
240 l/sec
(3770 gpm)
510 l/sec
(8070 gpm)
B
SECONDARY SCALE PIT
C
DEEP BED FILTRATION SYSTEM
D
510 l/sec
(8070 gpm)
To River
△-Sampling Points
Dwn. 10/19/81

PROCESS: Hot Forming - Primary & Section

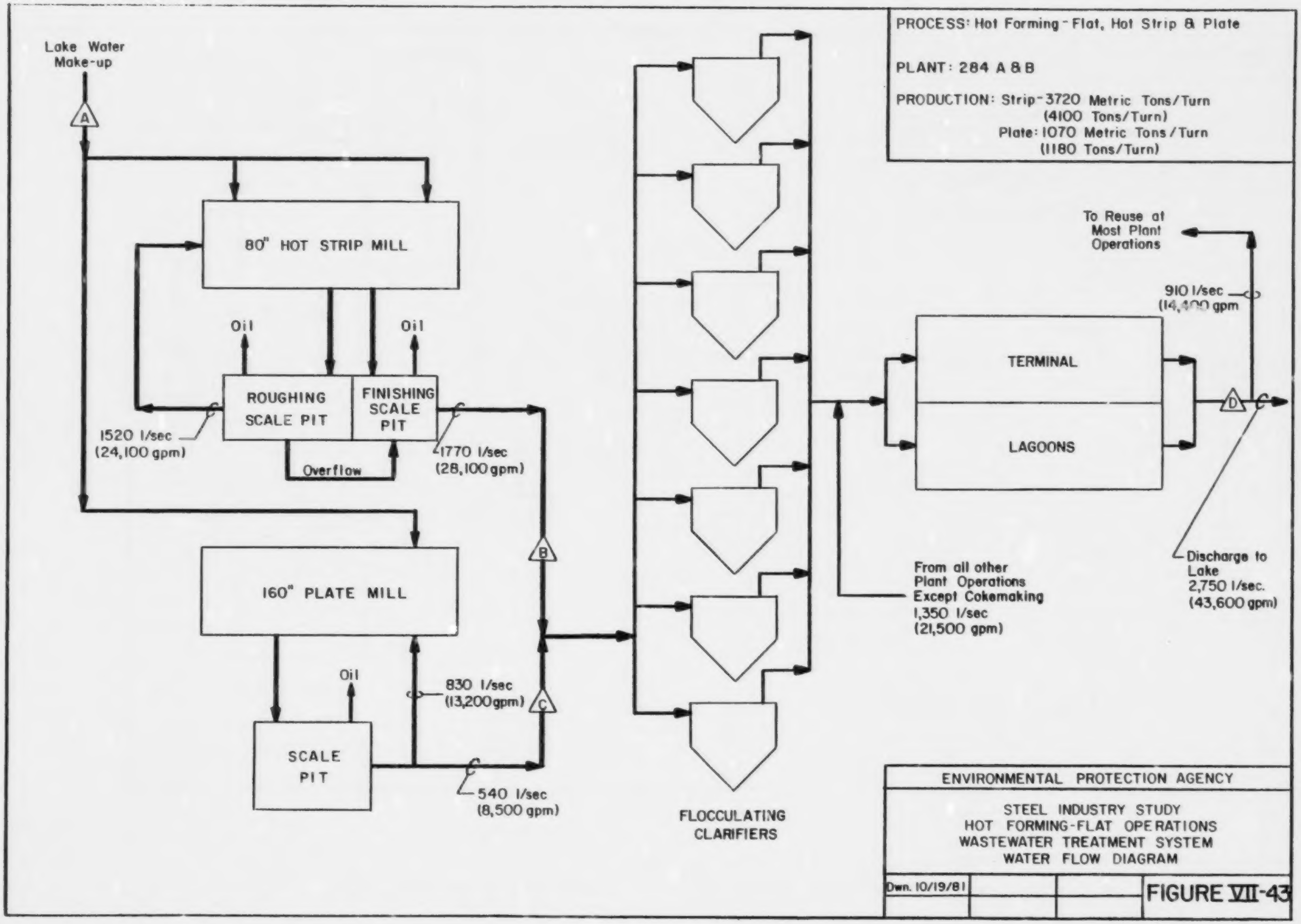
PLANT: 283

PRODUCTION: 1833 Metric Tons/Turn
(2020 Tons/Turn)

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-42


Lake Water Make-up
A
80" HOT STRIP MILL
Oil
Oil
ROUGHING SCALE PIT
FINISHING SCALE PIT
Overflow
1520 l/sec (24,100 gpm)
1770 l/sec (28,100 gpm)
160" PLATE MILL
Oil
SCALE PIT
830 l/sec (13,200gpm)
540 l/sec (8,500 gpm)
B
C
FLOCCULATING CLARIFIERS
From all other Plant Operations Except Cokemaking 1,350 l/sec (21,500 gpm)
TERMINAL
LAGOONS
D
910 l/sec (14,400 gpm)
To Reuse at Most Plant Operations
Discharge to Lake 2,750 l/sec. (43,600 gpm)

PROCESS: Hot Forming - Flat, Hot Strip & Plate

PLANT: 284 A & B

PRODUCTION: Strip-3720 Metric Tons/Turn
(4100 Tons/Turn)
Plate: 1070 Metric Tons/Turn
(1180 Tons/Turn)

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING-FLAT OPERATIONS
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

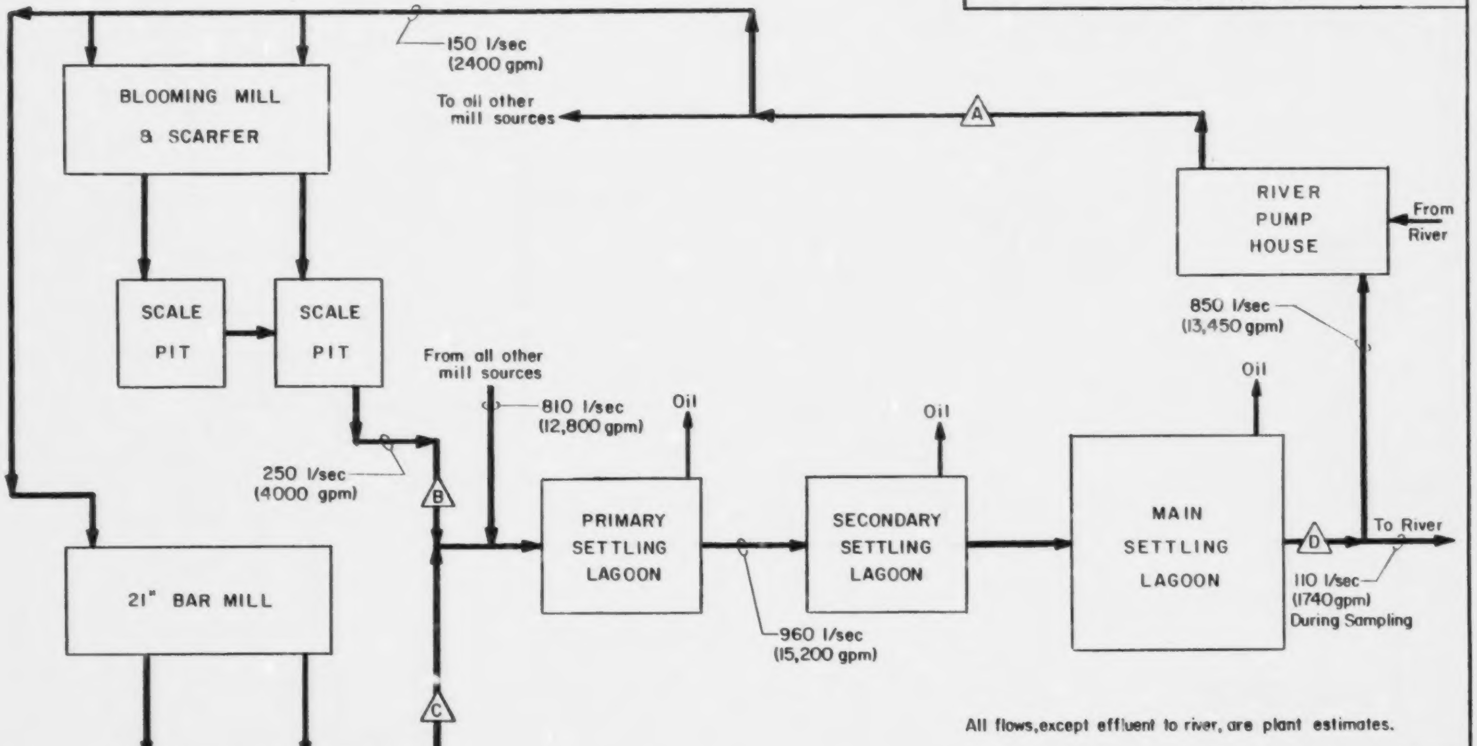
Dwn. 10/19/81

FIGURE VII-43

PROCESS: Hot Forming-Primary & Section

PLANT: 285 A & B

PRODUCTION: Primary-750 metric tons/turn
(827 tons/turn)
Section-335 metric tons/turn
(369 tons/turn)



150 l/sec (2400 gpm)
BLOOMING MILL & SCARFER
To all other mill sources
A
RIVER PUMP HOUSE
From River
SCALE PIT
SCALE PIT
850 l/sec (13,450 gpm)
From all other mill sources
810 l/sec (12,800 gpm)
Oil
Oil
Oil
250 l/sec (4000 gpm)
B
PRIMARY SETTLING LAGOON
SECONDARY SETTLING LAGOON
MAIN SETTLING LAGOON
D
To River
110 l/sec (1740 gpm) During Sampling
21" BAR MILL
960 l/sec (15,200 gpm)
C
SCALE PIT
SCALE PIT
130 l/sec (2000 gpm)

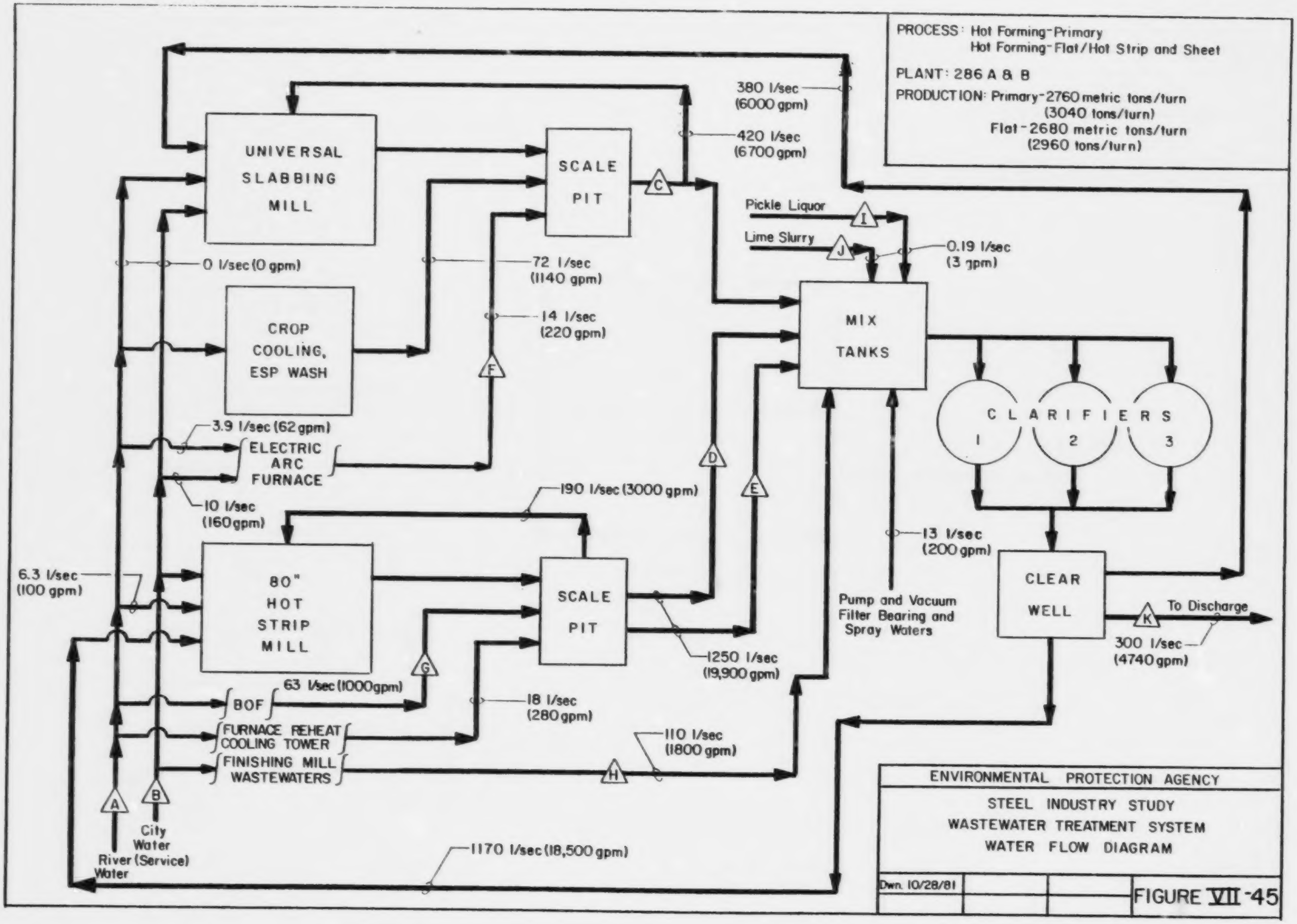
All flows, except effluent to river, are plant estimates.

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING SUBCATEGORY
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwn. 10/28/81

FIGURE VII-44


UNIVERSAL SLABBING MILL
CROP COOLING, ESP WASH
ELECTRIC ARC FURNACE
80" HOT STRIP MILL
BOF
FURNACE REHEAT COOLING TOWER
FINISHING MILL WASTEWATERS
SCALE PIT
SCALE PIT
MIX TANKS
CLARIFIERS
1
2
3
CLEAR WELL
To Discharge
Pickle Liquor
Lime Slurry
Pump and Vacuum Filter Bearing and Spray Waters
City Water
River (Service) Water
A
B
C
D
E
F
G
H
I
J
K
0 l/sec (0 gpm)
72 l/sec (1140 gpm)
14 l/sec (220 gpm)
3.9 l/sec (62 gpm)
10 l/sec (160 gpm)
6.3 l/sec (100 gpm)
190 l/sec (3000 gpm)
63 l/sec (1000gpm)
18 l/sec (280 gpm)
110 l/sec (1800 gpm)
1250 l/sec (19,900 gpm)
1170 l/sec (18,500 gpm)
380 l/sec (6000 gpm)
420 l/sec (6700 gpm)
0.19 l/sec (3 gpm)
13 l/sec (200 gpm)
300 l/sec (4740 gpm)

PROCESS: Hot Forming-Primary
Hot Forming-Flat/Hot Strip and Sheet

PLANT: 286 A & B

PRODUCTION: Primary-2760 metric tons/turn
(3040 tons/turn)
Flat-2680 metric tons/turn
(2960 tons/turn)

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

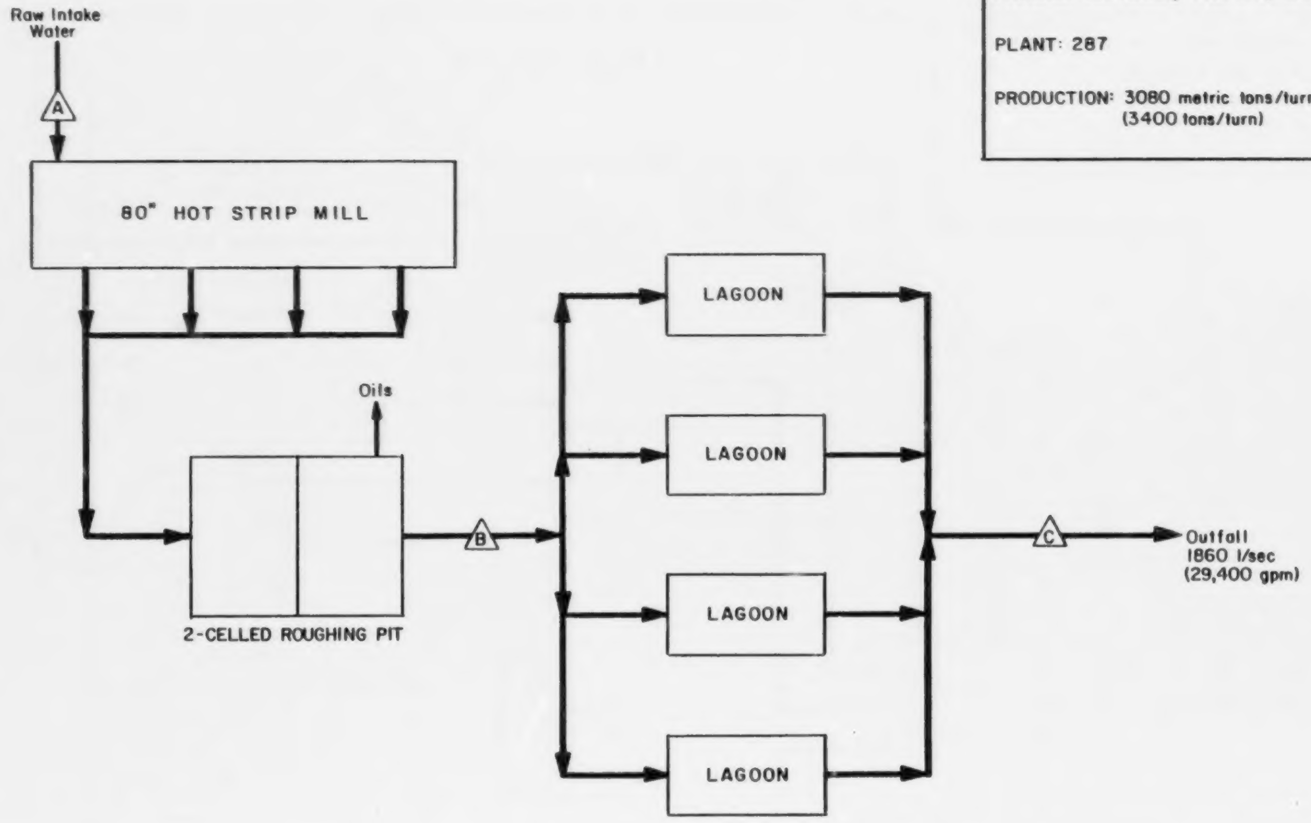
Dwn. 10/28/81

FIGURE VII-45

PROCESS: Hot Forming - Flat/Strip & Sheet

PLANT: 287

PRODUCTION: 3080 metric tons/turn
(3400 tons/turn)

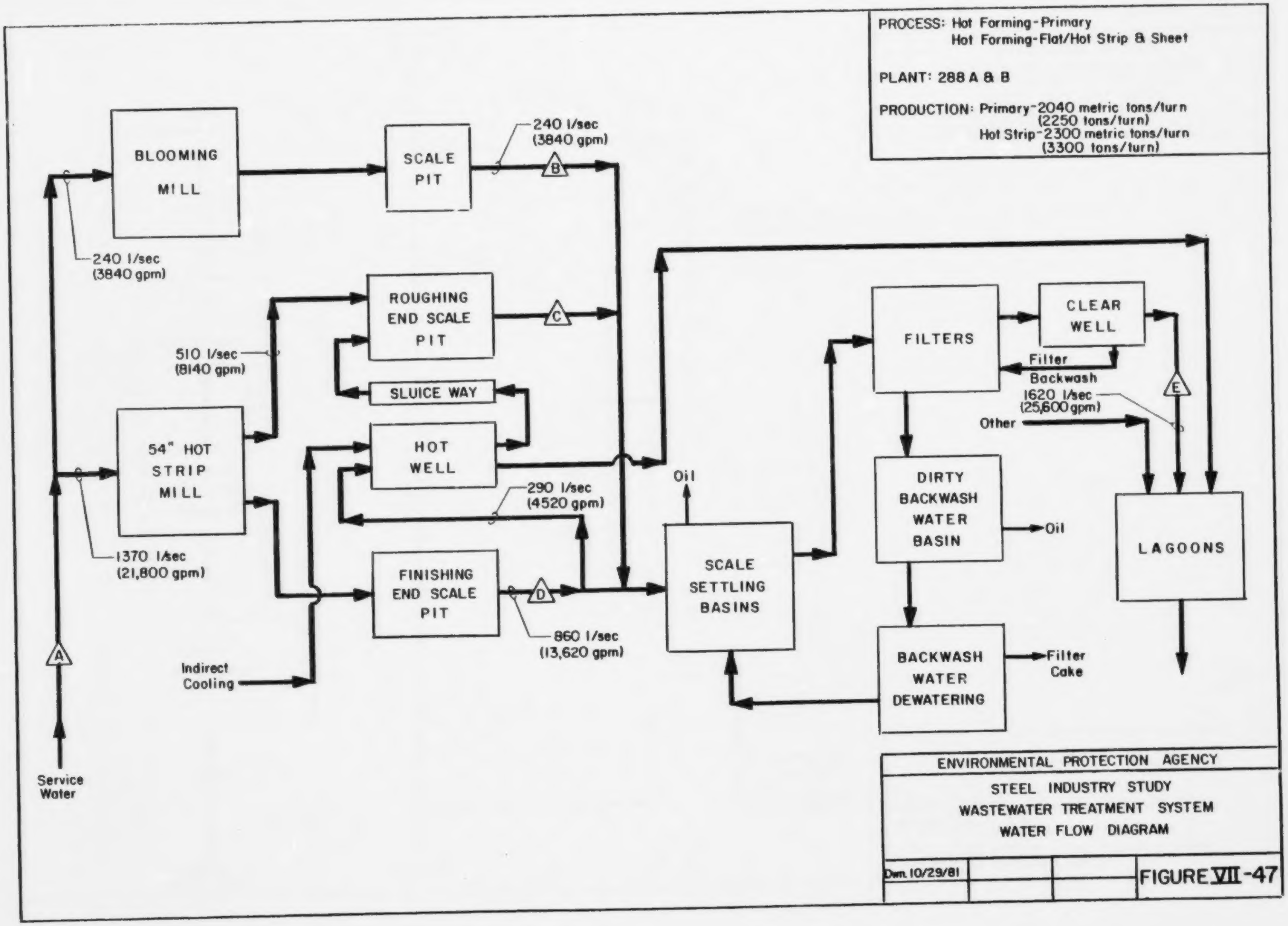

Raw Intake Water
A
80" HOT STRIP MILL
Oils
2-CELLED ROUGHING PIT
B
LAGOON
LAGOON
LAGOON
LAGOON
C
Outfall
1860 l/sec
(29,400 gpm)

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING-FLAT/STRIP & SHEET
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwn. 10/29/81

FIGURE VII-46



PROCESS: Hot Forming-Primary
Hot Forming-Flat/Hot Strip & Sheet

PLANT: 288 A & B

PRODUCTION: Primary-2040 metric tons/turn
(2250 tons/turn)
Hot Strip-2300 metric tons/turn
(3300 tons/turn)

BLOOMING MILL
SCALE PIT
240 l/sec (3840 gpm)
240 l/sec (3840 gpm)
B
ROUGHING END SCALE PIT
C
510 l/sec (8140 gpm)
SLUICE WAY
54" HOT STRIP MILL
HOT WELL
290 l/sec (4520 gpm)
1370 l/sec (21,800 gpm)
FINISHING END SCALE PIT
D
860 l/sec (13,620 gpm)
Indirect Cooling
A
Service Water
Oil
SCALE SETTLING BASINS
FILTERS
CLEAR WELL
Filter Backwash
1620 l/sec (25,600 gpm)
E
Other
DIRTY BACKWASH WATER BASIN
Oil
LAGOONS
BACKWASH WATER DEWATERING
Filter Cake

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

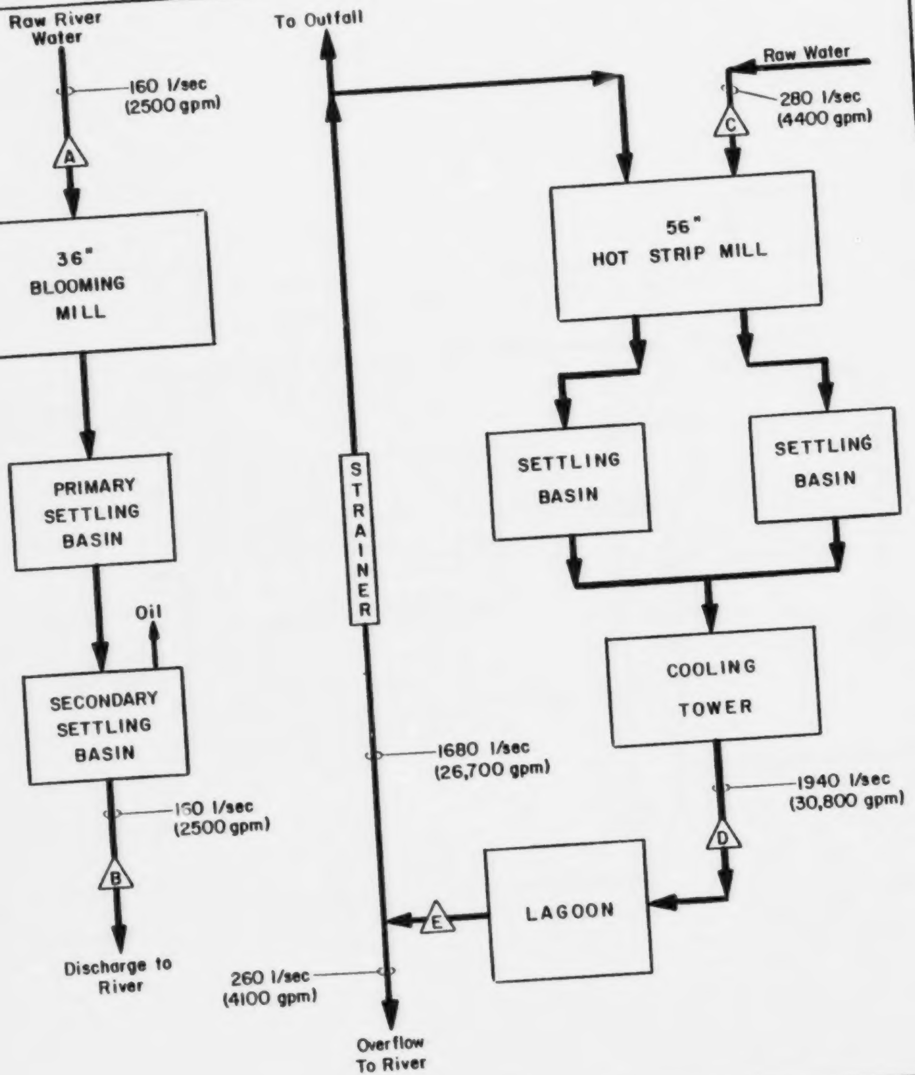
Dwn. 10/29/81

FIGURE VII-47

PROCESS: Hot Forming - Primary
Hot Forming - Flat/Hot Strip & Sheet

PLANT: 289 A & B

PRODUCTION: Primary - 1030 metric tons/turn
(1140 tons/turn)
Hot Strip - 2010 metric tons/turn
(2220 tons/turn)


Raw River Water
160 l/sec (2500 gpm)
A
36" BLOOMING MILL
PRIMARY SETTLING BASIN
Oil
SECONDARY SETTLING BASIN
160 l/sec (2500 gpm)
B
Discharge to River
To Outfall
STRAINER
1680 l/sec (26,700 gpm)
260 l/sec (4100 gpm)
Overflow To River
Raw Water
280 l/sec (4400 gpm)
C
56" HOT STRIP MILL
SETTLING BASIN
SETTLING BASIN
COOLING TOWER
1940 l/sec (30,800 gpm)
D
LAGOON
E

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING SUBCATEGORY
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

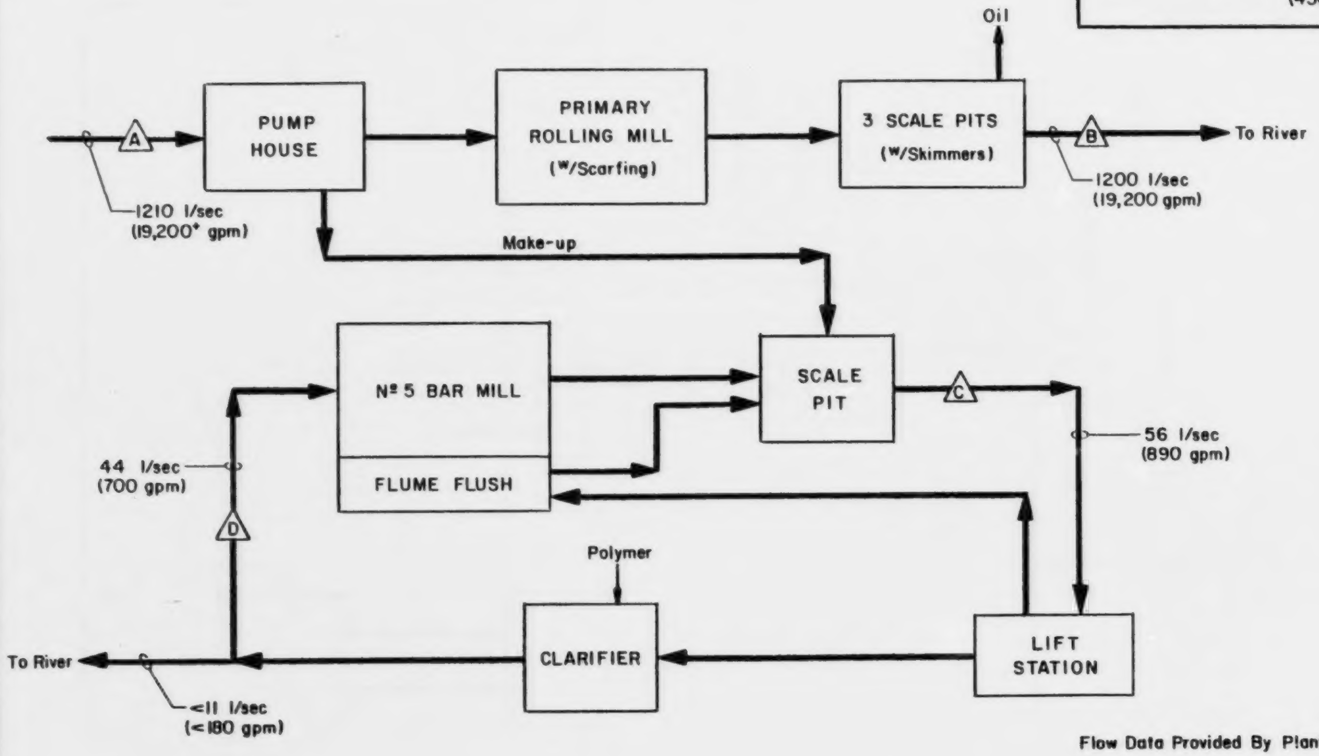
Dwn. 10/30/81

FIGURE VII-48

PROCESS: Hot Forming - Primary & Section

PLANT: 290 A & B

PRODUCTION: Primary - 1300 metric tons/turn
(1440 tons/turn)
Section - 408 metric tons/turn
(450 tons/turn)



Oil
PUMP HOUSE
PRIMARY ROLLING MILL (W/Scarfing)
3 SCALE PITS (W/Skimmers)
To River
A
B
1210 l/sec (19,200+ gpm)
1200 l/sec (19,200 gpm)
Make-up
Nº 5 BAR MILL
FLUME FLUSH
SCALE PIT
C
56 l/sec (890 gpm)
44 l/sec (700 gpm)
D
Polymer
CLARIFIER
LIFT STATION
To River
<11 l/sec (<180 gpm)

Flow Data Provided By Plant Personnel.

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING SUBCATEGORY
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwn. 10/30/81

FIGURE VII-49

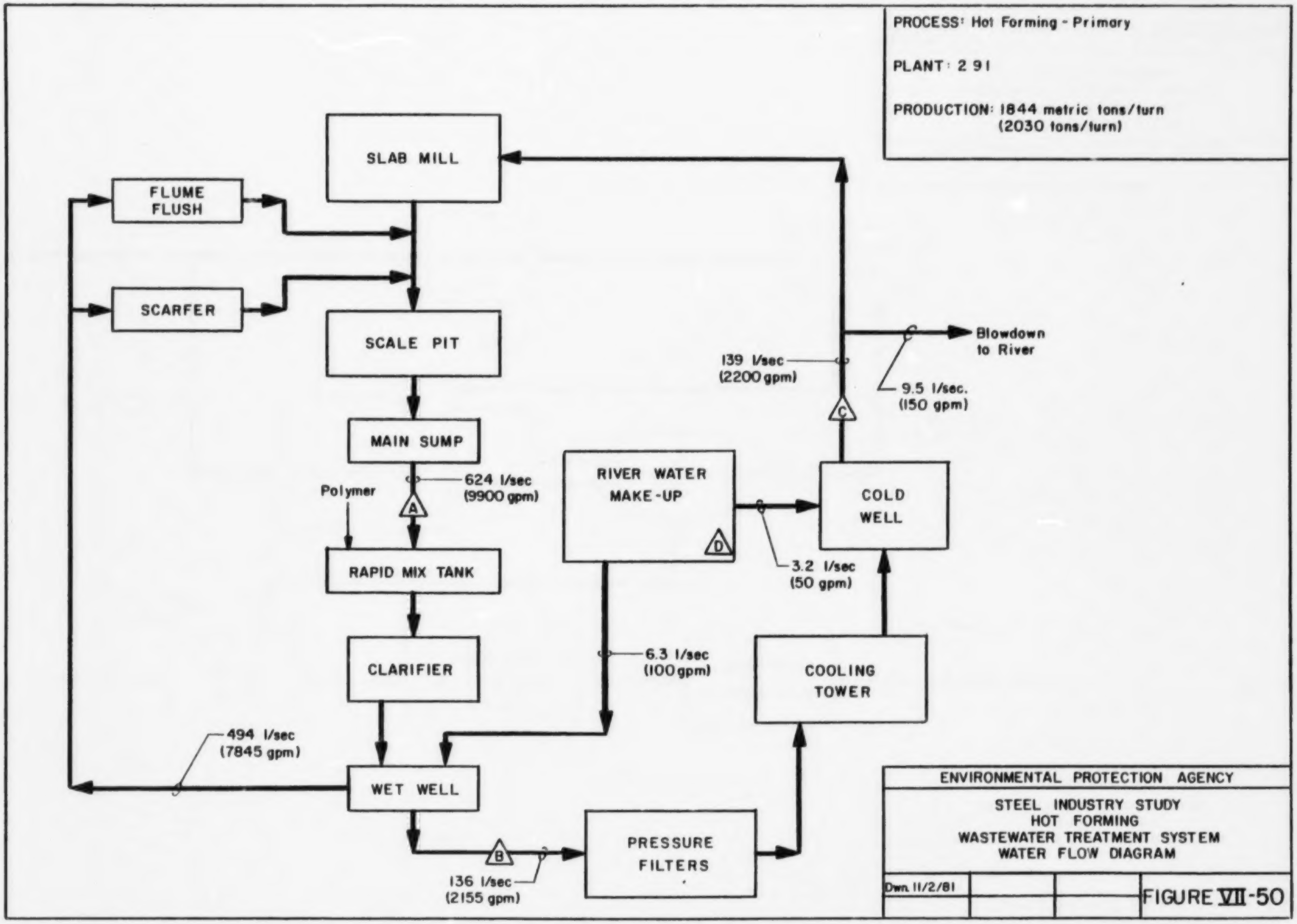
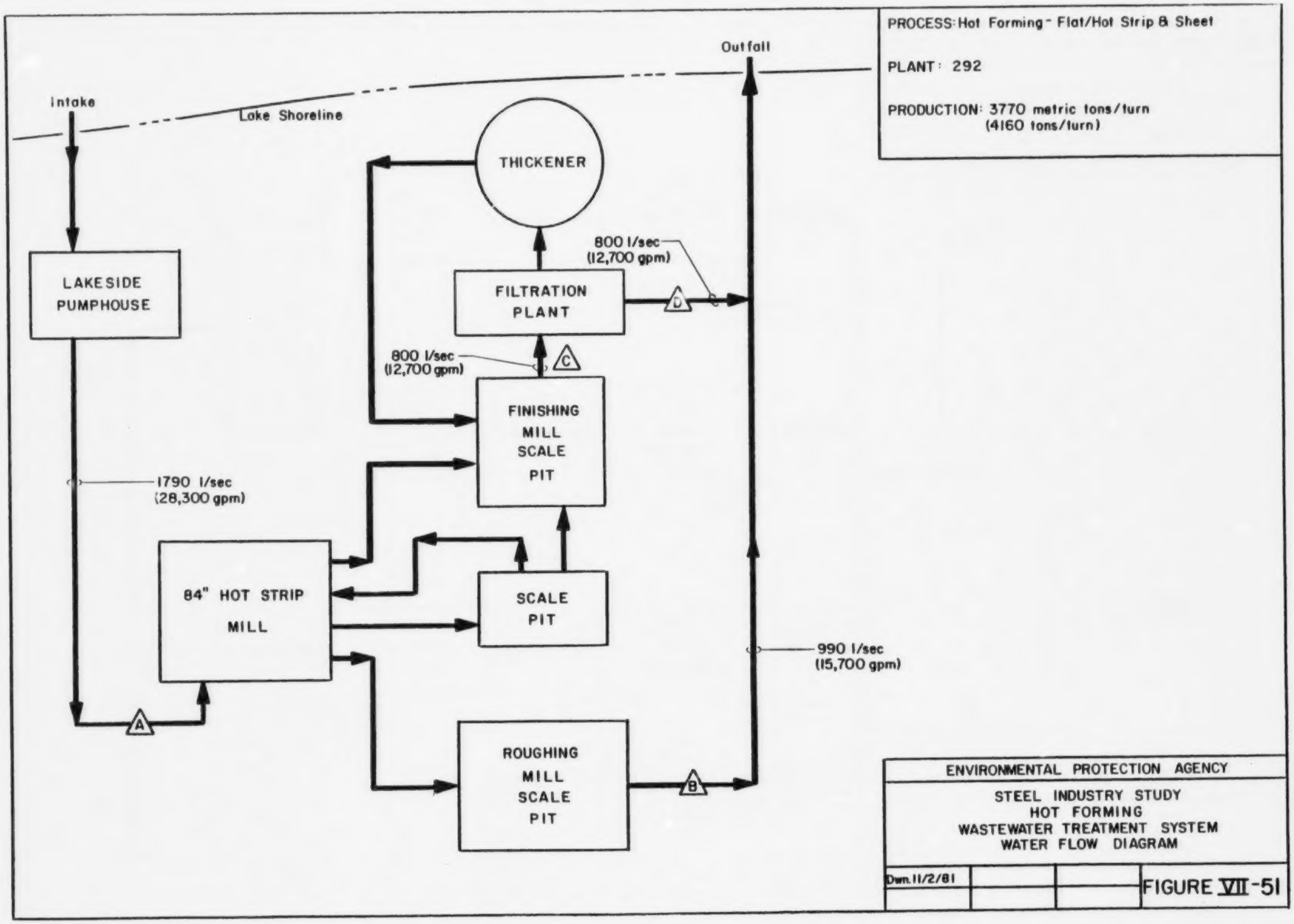

PROCESS: Hot Forming - Primary
PLANT: 2 91
PRODUCTION: 1844 metric tons/turn
(2030 tons/turn)
SLAB MILL
FLUME FLUSH
SCARFER
SCALE PIT
MAIN SUMP
624 l/sec
(9900 gpm)
A
Polymer
RAPID MIX TANK
CLARIFIER
WET WELL
494 l/sec
(7845 gpm)
B
136 l/sec
(2155 gpm)
PRESSURE FILTERS
RIVER WATER MAKE-UP
D
6.3 l/sec
(100 gpm)
3.2 l/sec
(50 gpm)
COOLING TOWER
COLD WELL
C
139 l/sec
(2200 gpm)
Blowdown to River
9.5 l/sec.
(150 gpm)
ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT FORMING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM
Dwn. 11/2/81

FIGURE VII-50


Intake
Lake Shoreline
Outfall
LAKESIDE PUMPHOUSE
1790 l/sec (28,300 gpm)
A
84" HOT STRIP MILL
THICKENER
FILTRATION PLANT
800 l/sec (12,700 gpm)
D
800 l/sec (12,700 gpm)
C
FINISHING MILL SCALE PIT
SCALE PIT
ROUGHING MILL SCALE PIT
B
990 l/sec (15,700 gpm)

PROCESS: Hot Forming - Flat/Hot Strip & Sheet

PLANT: 292

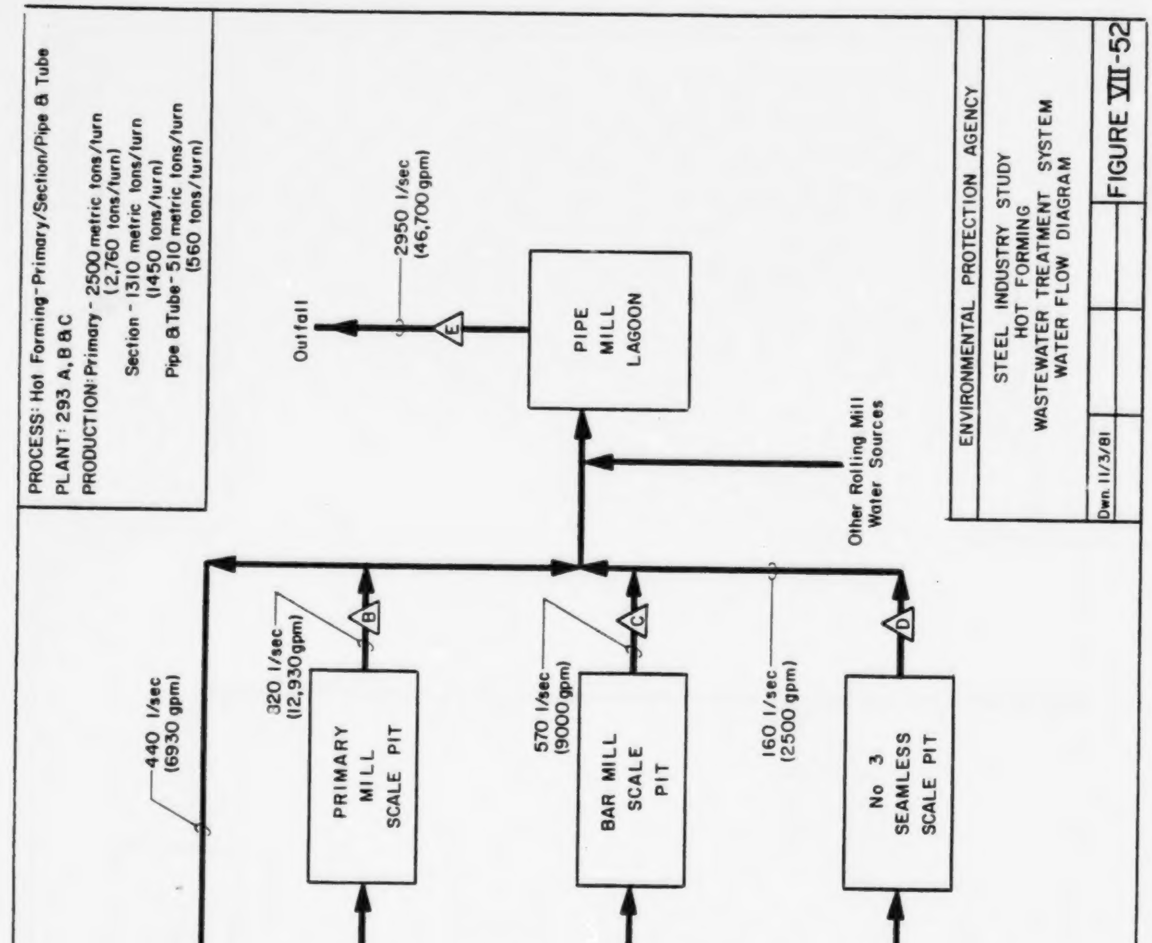
PRODUCTION: 3770 metric tons/turn
(4160 tons/turn)

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwn. 11/2/81

FIGURE VII-51


Intake
No 3 PUMPHOUSE
A
380 l/sec (6000 gpm)
PRIMARY ROLLING MILL
PRIMARY MILL SCALE PIT
320 l/sec (12,930 gpm)
B
440 l/sec (6930 gpm)
To Sluicing Operation
10-12 INCH BAR MILL
BAR MILL SCALE PIT
570 l/sec (9000 gpm)
C
No 3 SEAMLESS MILL
No 3 SEAMLESS SCALE PIT
160 l/sec (2500 gpm)
D
Other Rolling Mill Water Sources
PIPE MILL LAGOON
E
2950 l/sec (46,700 gpm)
Outfall

PROCESS: Hot Forming-Primary/Section/Pipe & Tube
PLANT: 293 A, B & C
PRODUCTION: Primary - 2500 metric tons/turn (2,760 tons/turn)
Section - 1310 metric tons/turn (1450 tons/turn)
Pipe & Tube - 510 metric tons/turn (560 tons/turn)

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

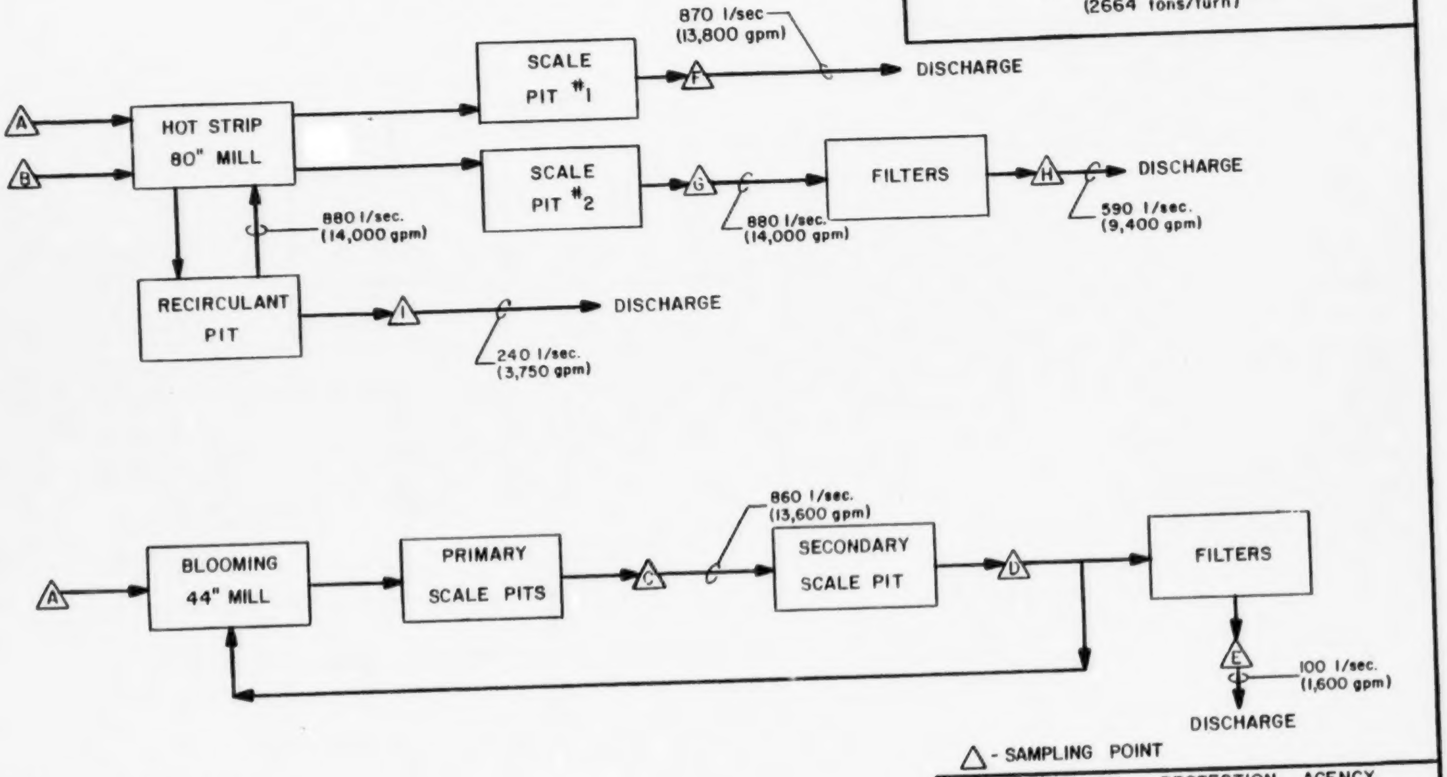
Dwn. 11/3/81

FIGURE VII-52

PROCESS: Hot Forming - Primary/Flat/Hot Strip & Sheet

PLANT: 294 A & B

PRODUCTION[1]: Primary - 1374 metric tons/turn
(1515 tons/turn)
Flat - 2417 metric tons/turn
(2664 tons/turn)


870 l/sec
(13,800 gpm)
A
B
HOT STRIP
80" MILL
SCALE
PIT #1
F
DISCHARGE
SCALE
PIT #2
G
880 l/sec.
(14,000 gpm)
FILTERS
H
DISCHARGE
590 l/sec.
(9,400 gpm)
880 l/sec.
(14,000 gpm)
RECIRCULANT
PIT
I
DISCHARGE
240 l/sec.
(3,750 gpm)
860 l/sec.
(13,600 gpm)
A
BLOOMING
44" MILL
PRIMARY
SCALE PITS
C
SECONDARY
SCALE PIT
D
FILTERS
E
100 l/sec.
(1,600 gpm)
DISCHARGE
△ - SAMPLING POINT

(1) Based upon 1976 production.

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

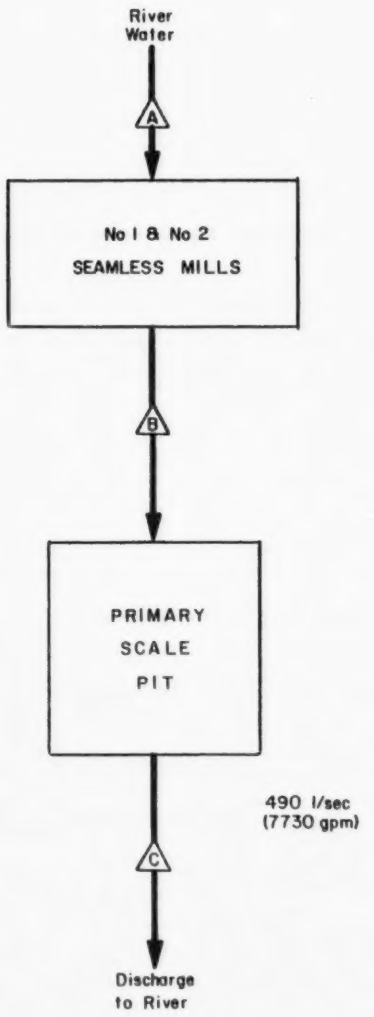
Dwn. 3/2/81

FIGURE VII-53

PROCESS: Hot Forming - Pipe & Tube

PLANT: 295

PRODUCTION: 600 metric tons/turn
(660 tons/turn)


River Water
A
No 1 & No 2 SEAMLESS MILLS
B
PRIMARY SCALE PIT
490 l/sec (7730 gpm)
C
Discharge to River

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwn. 11/3/81

FIGURE VII-54

HOT FORMING SUBCATEGORY

SECTION VIII

COST, ENERGY, AND NON-WATER QUALITY IMPACTS

Introduction

This section presents investment and annual costs associated with the different levels of pollution control technology considered for the hot forming subcategory. The analysis addresses energy requirements, non-water quality impacts, and the techniques, magnitude, and costs associated with the application of the BPT, BAT, NSPS, PSES, and PSNS limitations and standards.

Actual Costs Incurred By the Plants for Sampled Plants

In response to Agency requests, the industry supplied water pollution control costs for hot forming operations sampled during this study and for those operations solicited by D-DCPs. The Agency adjusted these costs to July, 1978 dollars for comparison with EPA Model based estimates. All estimates that were provided by industry for systems treating only hot forming wastes were included in cost comparison of hot forming treatment costs described below.

Table VIII-1 presents a comparison of actual investment costs incurred by the industry for several hot forming operations with EPA model based estimates of the installed treatment facilities. All costs are in July 1978 dollars. As shown, the Agency's model based cost estimates compare favorably with actual industry costs. The Agency's estimates are over 20 percent higher than actual industry costs for the 24 facilities shown in Table VIII-1.

The Agency also verified its model-based cost estimates for central treatment systems. The Agency compared its model-based treatment costs with industry costs for several central treatment systems by summing the model-based treatment costs for each subcategory included in the existing central treatment systems. The results of this comparison (presented in Volume I) demonstrate that the Agency's costing methodology accurately reflects industry costs for central treatment facilities in general, and for those systems including hot forming wastewaters in particular. In fact, as shown by the data presented in Volume I, the Agency's cost estimates for separate treatment for all finishing operation wastewaters are likely to be significantly higher than industry costs for central treatment.

Control and Treatment Technology (C&TT) Recommended for Use in the Hot Forming Subcategory

The treatment system components considered for BPT and BAT are presented in Table VIII-2. The C&TT steps are identical for all hot forming subdivisions. The limitations and standards do not require the use of the model treatment systems; any treatment system which achieves the limitations and standards is acceptable.

The following items are described in Table VIII-2.

1. Description of individual treatment components
2. Implementation time
3. Land requirements

Tables VIII-3 and VIII-4 present the land requirements for the components of the BPT and BAT treatment models.

Cost, Energy, and Non-water Quality Impacts

Introduction

Compliance with the BPT and BAT limitations and the NSPS, PSES, and PSNS will require additional expenditures (both investment and operating) and additional energy consumption. This section addresses these requirements and the air pollution, water consumption and solid waste disposal impacts associated with each treatment system considered. Costs and energy requirements were estimated on the basis of the alternative treatment models developed in Sections IX through XIII of this report. Figures VIII-1 and VIII-2 illustrates the BPT and BAT, NSPS, PSES, and PSNS alternative treatment models.

Development of Costs for the Hot Forming Subcategory

To develop the compliance costs for the alternate treatment systems, actual treatment practices within the hot forming subcategory were analyzed to determine the types of treatment facilities currently in use. First, the Agency found that wastewaters from over 90% of the hot forming operations are treated in central treatment systems. Although there are over 400 separate hot forming operations in this country, there are over 200 joint treatment facilities. EPA model treatment systems were initially costed on the basis of joint treatment for mills in the same hot forming subdivision. For example, if there are five section mills at one plant site, it was assumed that the combined waste stream from these mills will be treated in one system. Therefore only one treatment system was costed based upon the combined tonnage of the five mills. In this way the effect of joint treatment of like wastewaters (same subdivision) was accounted for in the cost estimates. The Agency believes that this approach is justified since almost all hot forming plants treat the hot forming wastewaters from the same types of mills in a joint treatment system. Likewise, if different hot forming wastewaters are combined in one system (i.e., primary and section wastewaters) still greater cost reductions can be achieved.

In developing costs for the proposed regulation, the Agency categorized hot forming operations by the type treatment systems in place and used comingling factors to account for cost savings associated with joint treatment. The Agency used one model treatment system for developing required investment and annual costs for this regulation. Comingling factors across the hot forming subdivisions were not used to develop costs for the final regulation in the interest of providing more conservative estimated costs. Comingling factors used to develop costs for the proposed regulation are set out in the draft development document.

Estimated Costs for the Installation of Pollution Control Technologies

A. Costs Required to Achieve the BPT Limitations

The Agency developed model systems upon which cost estimates are based. The model size (tons/day) and applied flow rates for each model were developed on the basis of the average production capacity and average applied flow rate for each hot forming subdivision. Reference is made to Section IX for identification of the model BPT treatment system. Tables VIII-5 through VIII-16 present the BPT model treatment component capital and annual costs. The Agency has calculated costs for facilities in-place at each hot forming operation, and has estimated the costs of the model system components required to achieve the BPT limitations. On the basis of the cost comparison provided previously in this section, the Agency believes that its cost estimates are sufficiently generous to cover site-specific and other retrofit costs.

The capital cost requirements for achieving the BPT limitations were determined by applying the model treatment component costs, adjusted for size, to each hot forming operation. Table VIII-17 presents a summary of the estimated expenditures already made or required to achieve the BPT limitations. Based upon these data, the Agency estimates that as of July 1, 1981 approximately 94.9 million dollars remains to be spent for BPT facilities. The associated annual cost of operation of BPT for all hot forming operations is estimated to be 12.0 million dollars.

B. Costs Required to Achieve the BAT Limitations

The Agency considered two BAT alternative treatment systems for the hot forming subcategory. Reference is made to Section X for a description of these treatment systems. Tables VIII-18 through VIII-29 present the BAT model costs. The additional capital and operating costs associated with the implementation of BAT are summarized below for the two alternatives:

	Costs (Millions of Dollars)			
	Capital		Annual	
	In-place	Required	In-place	Required
BAT-1	74.46	214.79	10.07	34.28
BAT-2	74.46	1388.47	10.07	264.82

C. Costs Required to Achieve the BCT Limitations

The BCT limitations are the same as the BPT limitations for all segments and subdivisions. No additional treatment and costs beyond BPT are, therefore, required.

D. Costs Required to Achieve NSPS

The Agency selected an NSPS treatment system for all hot forming operations which incorporates all of the components proposed in the BAT Alternative 1 system. New facilities constructed after proposal of these standards will be required to achieve NSPS. Model costs have been developed for two NSPS alternative treatment systems as shown in Tables VIII-30 through VIII-41 for the hot forming subdivisions.

E. Costs Required to Achieve Pretreatment Standards

The Agency has determined that only the General Pretreatment Standards (CFR 40, Part 403) will apply to hot forming operations.

Energy Impacts

A. BPT

The Agency estimated the energy expenditures for the BPT treatment systems. These estimates are based upon the assumption that all hot forming operations will install treatment systems as described by the treatment models. It is estimated that operation of the BPT model treatment system components for all hot forming operations will consume approximately 195.7 million kilowatts of electricity per year. This represents about 0.3% of the 57 billion kilowatts used by the steel industry in 1978. Table VIII-42 summarizes the energy requirements for each hot forming subdivision.

B. BAT

Additional power consuming equipment will be necessary to upgrade the industry from the BPT treatment system to the two BAT alternative treatment systems. The energy requirements for the two BAT alternatives are presented in Table VIII-42.

C. NSPS, PSES, and PSNS

The NSPS, PSES, and PSNS treatment systems are comprised of the BPT model treatment system and BAT alternative treatment system components. Therefore, the energy requirements per model plant will be equivalent to the summation of the BPT and BAT energy requirements. The Agency did not calculate the energy impacts for NSPS and PSNS since the number of new source hot forming operations was not projected as part of this study. The energy requirements of PSES are shown on Table VIII-43.

Non-water Quality Impacts

In general, there are minimal non-water quality impacts associated with the treatment technologies considered for the hot forming subcategory. The Agency analyzed three impacts: air pollution; solid waste disposal; and water consumption. The Agency found that no significant non-water quality impacts will result from the installation of the hot forming subcategory treatment systems under consideration.

A. Air Pollution

The use of cooling towers in BAT Alternatives 1 and 2 will result in the generation of water vapor plumes; however, these plumes should not contain significant levels of particulates or volatile organics. No other air impacts are expected to occur as a result of the installation of the cooling towers. Therefore, no significant air pollution impacts from this alternative are expected. Nor are significant direct air pollution impacts expected from operation of the evaporative systems included in Alternative 2.

B. Solid Waste Disposal

Sedimentation of hot forming wastewaters, which are high in suspended solids, results in the generation of significant quantities of sludges. The Agency has estimated the amount of solid waste generated in the BPT and BAT treatment systems and has listed the BPT values in Table VIII-44.

About 5,800,000 tons of sludge are generated at the BPT level of treatment. However, most of this solid waste, which consists of both solids and oils, is collected in the primary scale pit. The solids are removed either by clam shell or by drag link conveyor. Oils are usually collected by skimmers or oil troughs. The oils are collected and disposed of off-site if they cannot by reused or reclaimed for other uses. The scale, because of its high iron content, is collected and often reused as feed to sinter plants.

Because most solid and oil collection occurs at the BPT level of treatment, sludge generation by the BAT alternative treatment systems is small, on the order of 0.2-0.3% of the sludge generation at the BPT level. Therefore, there would be very little impact with respect to sludge generation as a result of the implementation of either BAT alternative system.

As noted previously, NSPS, PSES, and PSNS systems are made up of BPT and BAT treatment system components. Therefore, the sludge generation at NSPS, PSES, and PSNS would be equivalent to the sludge generation rates of the BPT and BAT systems. However, as explained above, most of the sludge produced at the BPT level of treatment can be reclaimed and reused. This, in combination with the small sludge generation rates in the BAT treatment system components, results in negligible impacts at NSPS, PSES, and PSNS.

C. Water Consumption

In the hot forming subcategory, cooling towers are components of the BAT, BCT, NSPS, PSES, and PSNS alternative treatment systems. Those towers would evaporate some water. Cooling towers have been considered as treatment components in order to allow higher degrees of recycle. The Agency analyzed the degree of water consumption and its impact. However, it found that the degree of water consumption that results from the use of the alternative treatment systems is not severe. The analysis detailed the type of cooling devices in use at hot forming operations, the evaporation rates for the cooling devices in use, and quantified the amount of water that would be consumed in order to meet BAT limitations. It was determined that of the 3900 MGD of process water applied to the hot forming operations, less than 19.4 MGD or 0.5% of this water will be consumed due to evaporation from BAT treatment components. This amount of water consumption is not significant, even to plants in "arid" or "semi-arid" regions. This analysis is discussed in Section III of Volume I of the Development Document. The Agency finds that the amount of water consumed in complying with this regulation is not significant on both a national and water scarce regional basis when compared to the effluent reduction benefits achieved. High recycle rates also serve to minimize necessary surface and subsurface water withdrawals and run-of-the-river type cooling which can cause nearly as much consumptive loss as evaporative cooling facilities. Plants in arid and semi-arid regions have had high rate recycle systems in operation for many years.

Summary of Impacts

The Agency concludes that the effluent reduction benefits described below for the hot forming subcategory outweigh the adverse impacts associated with energy consumption, air pollution, solid waste disposal, and water consumption.

	Effluent Loadings (Tons/Year)	
	Raw Waste	BPT
Flow, MGD	3,680	1,419
TSS	5,878,201	15,081
Oil and Grease	174,540	3,078
Toxic Metals	49,460	114

The Agency also concludes that the effluent reduction benefits associated with compliance with new source standards (NSPS) outweigh the adverse energy and non-water quality environmental impacts.

TABLE VIII-1

COMPARISON OF ACTUAL COSTS REPORTED BY INDUSTRY VERSUS EPA ESTIMATES
HOT FORMING

(July 1978 Dollars)

PLANT	SUBDIVISION	SOURCE OF REPORTED COST	COST REPORTED BY INDUSTRY	EPA MODEL COSTS
0020B	Flat	Plant Visit	$ 1,901,300	$ 4,009,400
0060F	Section	D-DCP	3,912,299	5,485,100
0088D	Primary & Section	D-DCP	1,260,014	2,904,400
0112B	Primary	D-DCP	2,577,783	5,133,300
0112B	Primary & Section	Plant Visit	3,544,320	8,271,140
0112B	Primary & Section	Plant Visit	2,968,580	7,603,000
0196A	Pipe & Tube	Plant Visit	4,168,786	7,768,076
0240B	Pipe & Tube	D-DCP	969,568	791,110
0396D	Flat	Plant Visit	3,110,775	3,845,489
0440A	Primary	D-DCP	2,138,600	473,700
0460A	Primary	D-DCP	340,000	1,017,100
0612	Primary & Section	D-DCP	9,000,000	14,129,200
0640A	Section	Plant Visit	984,500	2,393,650
0652A	Pipe & Tube	D-DCP	285,348	213,700
0684B	Flat	D-DCP	3,798,072	5,587,000
0684H	Primary, Section, Pipe & Tube	Plant Visit	19,812,800	11,393,950
0684H	Section	D-DCP	5,458,752	3,807,800
0860B	Flat	Plant Visit	3,316,442	8,953,260
0860H (03)	Section	D-DCP	3,331,644	4,502,200
0868A	Primary	D-DCP	303,441	2,317,400
0916A	Pipe & Tube	Plant Visit	609,600	712,300
0920A	Primary	D-DCP	356,616	1,971,400
0920N	Primary	D-DCP	340,119	1,785,400
0920N	Flat	D-DCP	4,381,044	3,865,400
			$78,870,403	$107,455,970

TABLE VIII-2

CONTROL AND TREATMENT TECHNOLOGIES
HOT FORMING - PRIMARY, SECTION, FLAT, AND PIPE AND TUBE

Treatment and/or Control Methods Employed*	Implementation Time	Land Requirements
A. Primary Scale Pit - This step provides the initial stage for removal of heavy mill scale and the heavier suspended solids.	6-9 months	Refer to Table VIII-3
B. Surface Skimming - Removes oils and greases from the surface of the wastewater.	3 months	Refer to Table VIII-3
C. Recycle - Recycles a portion of the primary scale pit effluent back to the hot forming operation (principally for flume flushing).	12-15 months	Refer to Table VIII-3
D. Roughing Clarifier - Provides the capability for additional suspended solids removal.	15-18 months	Refer to Table VIII-3
E. Vacuum Filter - Used to dewater the sludges removed in Step D.	15-18 months	Refer to Table VIII-3

TABLE VIII-2
CONTROL AND TREATMENT TECHNOLOGIES
HOT FORMING - PRIMARY, SECTION, AND FLAT, AND PIPE AND TUBE
PAGE 2

Treatment and/or Control Methods Employed*	Implementation Time	Land Requirements
F. Pressure Filter - These filters provide additional suspended solids removal capability. The backwash is returned to the roughing clairifier.	15-18 months	Refer to Table VIII-3
G. Cooling Tower - Used to reduce the heat load of the wastewater recycle system.	18-20 months	Refer to Table VIII-4
H. Recycle - Increase the recycle rate the discharge flows to the BAT/BCT levels.	12-15 months	Refer to Table VIII-4
I. Vapor compression distillation - This step produces distillates quality water for recycle to the process.	6 months	Refer to Table VIII-4
J. Recycle - The water produced in Step I is completely recycled to the process.	12-15 months	Refer to Table VIII-4

TABLE VIII-3

LAND REQUIREMENTS SUMMARY HOT FORMING SUBCATEGORY

BPT Treatment Models

	C&TT Steps					
Subdivision	A (PSP)	B (SS)	C (RUP)	D (CL)	E (VF)	F (Filter)
PRIMARY						
a. Carbon						
w/o scarfers	1500 ft^2	(1)	(1)	1600 ft^2	225 ft^2	2000ft^2
w/scarfers	3600	(1)	(1)	3600	900	5000
b. Specialty						
w/o scarfers	600	(1)	(1)	600	260	600
w/ scarfers	1400	(1)	(1)	1400	600	1400
SECTION						
a. Carbon	2500	(1)	(1)	3025	900	4000
b. Specialty	900	(1)	(1)	900	400	900
FLAT						
a. Carbon Hot Strip and Sheet	5625	(1)	(1)	6400	1600	8000
b. Speciality Hot Strip and Sheet	1225	(1)	(1)	1225	400	1500
c. Carbon Plate	1600	(1)	(1)	2025	625	2400
d. Specialty Plate	400	(1)	(1)	625	225	625
PIPE AND TUBE						
a. Carbon	900	(1)	(1)	900	225	625
b. Specilaity	900	(1)	(1)	625	225	625

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(1) No additional land required

Note: For definitions of C&TT codes refer to Table VII-1.

TABLE VIII-4

LAND REQUIREMENTS SUMMARY
HOT FORMING SUBCATEGORY

BAT TREATMENT MODELS

	C & TT Steps			
	BAT Alternative No. 1		BAT Alternative No. 2(1)	
Subdivision	G (CT)	H (RTP)	I (EME)	J (RTP)
Primary				
a. Carbon w/o scarfing	710 ft^2	2000 ft^2	3600 ft^2	625 ft^2
b. Carbon w/ scarfing	2045	3000	4900	1000
c. Specialty w/o scarfing	225	1000	3025	625
d. Specialty w/ scarfing	511	1500	3600	625
Section				
a. Carbon	1548	2500	4225	800
b. Specialty	336	1200	3600	625
Flat				
a. Carbon hot strip & sheet	3870	4000	10,000	1500
b. Specialty hot strip & sheet	480	1500	3600	625
c. Carbon plate	893	2000	3600	625
d. Specialty plate	125	800	3600	625
Pipe & Tube				
a. Carbon	238	1000	3600	625
b. Specialty	133	800	3025	625

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(1) These land requirements are in addition to those of Alternative 1. Each model's Alternative No. 2 incorporates all of the components of Alternative 1.

TABLE VIII-5

BPT TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Primary, Carbon
: Without Scarfers

Model Size-TPD : 3,800
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	A	B	C	D	E	F	Total
Investment ($ x 10^{-3})	268.3	25.0	601.0	315.2	180.2	910.0	2,299.7
Annual Costs ($ x 10^{-3})							
Capital	24.1	2.2	54.0	28.3	16.2	81.8	206.6
Operation & Maintenance	9.4	0.9	21.0	11.0	6.3	31.8	80.4
Land	0.1			0.1	0.1	0.1	0.4
Sludge Disposal					3.5		3.5
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power		0.3		2.3	4.1	11.6	18.3
Steam							
Waste Acid							
Crystal Disposal							
Chemical							
TOTAL	33.6	3.4	75.0	41.7	30.2	125.3	309.2
Credits							
Scale	336.3						336.3
Sinter							
Oil		17.4					17.4
Acid Recovery							
TOTAL CREDITS	336.3	17.4					353.7
NET TOTAL	-302.7	-14.0	75.0	41.7	30.2	125.3	-44.5

KEY TO C&TT STEPS

A: Primary Scale Pit
B: Surface Skimming
C: Recycle
D: Roughing Clarification
E: Vacuum Filtration
F: Pressure Filtration

TABLE VIII-6

BPT TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Primary, Carbon
: With Scarfers

Model Size-TPD : 7,400
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	A	B	C	D	E	F	Total
Investment ($ x 10^{-3})	423.5	60.5	1,167.4	492.0	327.1	2,392.0	4,862.5
Annual Costs ($ x 10^{-3})							
Capital	38.1	5.4	105.0	44.2	29.4	215.0	437.1
Operation & Maintenance	14.8	2.1	40.9	17.2	11.4	83.7	170.1
Land	0.2			0.2	0.1	0.3	0.8
Sludge Disposal					10.0		10.0
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power		0.6		2.3	5.2	20.4	28.5
Steam							
Waste Acid							
Crystal Disposal							
Chemical							
TOTAL	53.1	8.1	145.9	63.9	56.1	319.4	646.5
Credits							
Scale	1,314.8						1,314.8
Sinter							
Oil		29.8					29.8
Acid Recovery							
TOTAL CREDITS	1,314.8	29.8					1,344.6
NET TOTAL	-1,261.7	-21.7	145.9	63.9	56.1	319.4	-698.1

KEY TO C&TT STEPS

A: Primary Scale Pit
B: Surface Skimming
C: Recycle
D: Roughing Clarification
E: Vacuum Filtration
F: Pressure Filtration

TABLE VIII-7

BPT TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Primary, Specialty
: Without Scarfers

Model Size-TPD : 1,200
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	A	B	C	D	E	F	Total
Investment ($ x 10^{-3})	142.5	21.0	374.1	157.9	126.0	539.3	1,360.8
Annual Costs ($ x 10^{-3})							
Capital	12.8	1.9	33.6	14.2	11.3	48.5	122.3
Operation & Maintenance	5.0	0.7	13.1	5.5	4.4	18.9	47.6
Land	0.1			0.1	0.1	0.1	0.4
Sludge Disposal					1.3		1.3
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power		0.3		0.6	3.5	5.8	10.2
Steam							
Waste Acid							
Crystal Disposal							
Chemical							
TOTAL	17.9	2.9	46.7	20.4	20.6	73.3	181.8
Credits							
Scale	104.8						104.8
Sinter							
Oil		5.5					5.5
Acid Recovery							
TOTAL CREDITS	104.8	5.5					110.3
NET TOTAL	-86.9	-2.6	46.7	20.4	20.6	73.3	71.5

KEY TO C&TT STEPS

A: Primary Scale Pit
B: Surface Skimming
C: Recycle
D: Roughing Clarification
E: Vacuum Filtration
F: Pressure Filtration

TABLE VIII-8

BPT TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Primary, Specialty
: With Scarfers

Model Size-TPD : 1,850
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	A	B	C	D	E	F	Total
Investment ($ x 10^{-3})	220.3	25.0	538.0	258.8	162.5	758.3	1,962.9
Annual Costs ($ x 10^{-3})							
Capital	19.8	2.2	48.4	23.3	14.6	68.2	176.5
Operation & Maintenance	7.7	0.9	18.8	9.1	5.7	26.5	68.7
Land	0.1			0.1	0.1	0.1	0.4
Sludge Disposal					2.5		2.5
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power		0.3		1.2	3.5	8.7	13.7
Steam							
Waste Acid							
Crystal Disposal							
Chemical							
TOTAL	27.6	3.4	67.2	33.7	26.4	103.5	261.8
Credits							
Scale	323.2						323.2
Sinter							
Oil		7.5					7.5
Acid Recovery							
TOTAL CREDITS	323.2	7.5					330.7
NET TOTAL	-295.6	-4.1	67.2	33.7	26.4	103.5	-68.9

KEY TO C&TT STEPS

A: Primary Scale Pit
B: Surface Skimming
C: Recycle
D: Roughing Clarification
E: Vacuum Filtration
F: Pressure Filtration

TABLE VIII-9

BPT TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory:	Hot Forming	Model Size-TPD :	3,050
Subdivision:	Section, Carbon	Oper. Days/Year:	260
		Turns/Day :	3

C&TT Step	A	B	C	D	E	F	Total
Investment ($ x 10^{-3})	336.9	35.2	893.0	408.6	304.0	2,007.4	3,985.1
Annual Costs ($ x 10^{-3})							
Capital	30.3	3.2	80.3	36.7	27.3	180.5	358.3
Operation & Maintenance	11.8	1.2	31.3	14.3	10.6	70.3	139.5
Land	0.1			0.2	0.1	0.2	0.6
Sludge Disposal					7.5		7.5
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power		0.6		2.3	4.7	17.4	25.0
Steam							
Waste Acid							
Crystal Disposal							
Chemical							
TOTAL	42.2	5.0	111.6	53.5	50.2	268.4	530.9
Credits							
Scale	253.3						253.3
Sinter							
Oil		10.3					10.3
Acid Recovery							
TOTAL CREDITS	253.3	10.3					263.6
NET TOTAL	-211.1	-5.3	111.6	53.5	50.2	268.4	267.3

KEY TO C&TT STEPS

A:	Primary Scale Pit	D:	Roughing Clarification
B:	Surface Skimming	E:	Vacuum Filtration
C:	Recycle	F:	Pressure Filtration

TABLE VIII-10

BPT TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Section, Specialty

Model Size-TPD : 1,200
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	A	B	C	D	E	F	Total
Investment ($ x 10^{-3})	162.6	23.0	410.5	201.2	138.2	589.5	1,525.0
Annual Costs ($ x 10^{-3})							
Capital	14.6	2.1	36.9	18.1	12.4	53.0	137.1
Operation & Maintenance	5.7	0.8	14.4	7.0	4.8	20.6	53.3
Land	0.1			0.1	0.1	0.1	0.4
Sludge Disposal					1.7		1.7
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power		0.3		1.7	3.5	5.8	11.3
Steam							
Waste Acid							
Crystal Disposal							
Chemical							
TOTAL	20.4	3.2	51.3	26.9	22.5	79.5	203.8
Credits							
Scale	104.8						104.8
Sinter							
Oil		5.0					5.0
Acid Recovery							
TOTAL CREDITS	104.8	5.0					109.8
NET TOTAL	-84.4	-1.8	51.3	26.9	22.5	79.5	94.0

KEY TO C&TT STEPS

A: Primary Scale Pit
B: Surface Skimming
C: Recycle
D: Roughing Clarification
E: Vacuum Filtration
F: Pressure Filtration

TABLE VIII-11

BPT TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Flat, Carbon
: Hot Strip & Sheet

Model Size-TPD : 7,250
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	A	B	C	D	E	F	Total
Investment ($ x 10^{-3})	684.8	103.7	1,856.2	739.5	347.0	2,857.5	6,588.7
Annual Costs ($ x 10^{-3})							
Capital	61.6	9.3	166.9	66.5	31.2	256.9	592.4
Operation & Maintenance	24.0	3.6	65.0	25.9	12.1	100.0	230.6
Land	0.3			0.4	0.1	0.5	1.3
Sludge Disposal					18.2		18.2
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power		1.2		2.3	5.8	23.3	32.6
Steam							
Waste Acid							
Crystal Disposal							
Chemical							
TOTAL	85.9	14.1	231.9	95.1	67.4	380.7	875.1
Credits							
Scale	585.3						585.3
Sinter							
Oil		20.1					20.1
Acid Recovery							
TOTAL CREDITS	585.3	20.1					605.4
NET TOTAL	-499.4	-6.0	231.9	95.1	67.4	380.7	269.7

KEY TO C&TT STEPS

A: Primary Scale Pit
B: Surface Skimming
C: Recycle
D: Roughing Clarification
E: Vacuum Filtration
F: Pressure Filtration

TABLE VIII-12

BPT TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Flat, Specialty
: Hot Strip & Sheet

Model Size-TPD : 900
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	A	B	C	D	E	F	Total
Investment ($ x 10^{-3})	208.9	24.0	505.3	249.2	153.5	730.2	1,871.1
Annual Costs ($ x 10^{-3})							
Capital	18.8	2.2	45.4	22.4	13.8	65.6	168.2
Operation & Maintenance	7.3	0.8	17.7	8.7	5.4	25.6	65.5
Land	0.1			0.1	0.1	0.1	0.4
Sludge Disposal					2.3		2.3
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power		0.3		1.7	3.5	8.7	14.2
Steam							
Waste Acid							
Crystal Disposal							
Chemical							
TOTAL	26.2	3.3	63.1	32.9	25.1	100.0	250.6
Credits							
Scale	74.3						74.3
Sinter							
Oil		2.5					2.5
Acid Recovery							
TOTAL CREDITS	74.3	2.5					76.8
NET TOTAL	-48.1	0.8	63.1	32.9	25.1	100.0	173.8

KEY TO C&TT STEPS

A: Primary Scale Pit
B: Surface Skimming
C: Recycle
D: Roughing Clarification
E: Vacuum Filtration
F: Pressure Filtration

TABLE VIII-13

BPT TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Flat, Carbon
: Plate

Model Size-TPD : 3,150
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	A	B	C	D	E	F	Total
Investment ($ x 10^{-3})	329.0	26.8	621.4	361.5	241.0	1,039.6	2,619.3
Annual Costs ($ x 10^{-3})							
Capital	29.6	2.4	55.9	32.5	21.7	93.5	235.6
Operation & Maintenance	11.5	0.9	21.7	12.7	8.4	36.4	91.6
Land	0.1			0.1	0.1	0.1	0.4
Sludge Disposal					4.3		4.3
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power		0.3		2.3	4.1	8.7	15.4
Steam							
Waste Acid							
Crystal Disposal							
Chemical							
Total	41.2	3.6	77.6	47.6	38.6	138.7	347.3
Credits							
Scale	270.8						270.8
Sinter							
Oil		12.7					12.7
Acid Recovery							
TOTAL CREDITS	270.8	12.7					283.5
NET TOTAL	-229.6	-9.1	77.6	47.6	38.6	138.7	63.8

KEY TO C&TT STEPS

A: Primary Scale Pit
B: Surface Skimming
C: Recycle
D: Roughing Clarification
E: Vacuum Filtration
F: Pressure Filtration

TABLE VIII-14

BPT TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory:	Hot Forming	Model Size-TPD :	1,000
Subdivision:	Flat, Specialty	Oper. Days/Year:	260
:	Plate	Turns/Day :	3

C&TT Step	A	B	C	D	E	F	Total
Investment ($ x 10^{-3})	113.0	19.9	308.5	111.2	98.8	460.4	1,111.8
Annual Costs ($ x 10^{-3})							
Capital	10.2	1.8	27.7	10.0	8.9	41.4	100.0
Operation & Maintenance	4.0	0.7	10.8	3.9	3.5	16.1	39.0
Land	0.1			0.1	0.1	0.1	0.4
Sludge Disposal					0.6		0.6
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power		0.2		0.6	1.7	3.5	6.0
Steam							
Waste Acid							
Crystal Disposal							
Chemical							
TOTAL	14.3	2.7	38.5	14.6	14.8	61.1	146.0
Credits							
Scale	87.4						87.4
Sinter							
Oil		5.0					5.0
Acid Recovery							
TOTAL CREDITS	87.4	5.0					92.4
NET TOTAL	-73.1	-2.3	38.5	14.6	14.8	61.1	53.6

KEY TO C&TT STEPS

A: Primary Scale Pit
B: Surface Skimming
C: Recycle
D: Roughing Clarification
E: Vacuum Filtration
F: Pressure Filtration

TABLE VIII-15

BPT TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Pipe & Tube, Carbon

Model Size-TPD : 900
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	A	B	C	D	E	F	Total
Investment ($ x 10^{-3})	181.9	23.0	537.0	163.7	126.0	540.0	1,571.6
Annual Costs ($ x 10^{-3})							
Capital	16.3	2.1	48.3	14.7	11.3	48.5	141.2
Operation & Maintenance	6.4	0.8	18.8	5.7	4.4	18.9	55.0
Land	0.1			0.1	0.1	0.1	0.4
Sludge Disposal					1.2		1.2
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power		0.3		1.7	2.9	5.8	10.7
Steam							
Waste Acid							
Crystal Disposal							
Chemical							
TOTAL	22.8	3.2	67.1	22.2	19.9	73.3	208.5
Credits							
Scale	8.7						8.7
Sinter							
Oil		2.9					2.9
TOTAL CREDITS	8.7	2.9					11.6
NET TOTAL	14.1	0.3	67.1	22.2	19.9	73.3	196.9

KEY TO C&TT STEPS

A: Primary Scale Pit
B: Surface Skimming
C: Recycle
D: Roughing Clarification
E: Vacuum Filtration
F: Pressure Filtration

TABLE VIII-16

BPT TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Pipe & Tube, Specialty

Model Size-TPD : 500
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	A	B	C	D	E	F	Total
Investment ($ x 10^{-3})	142.5	21.0	399.1	115.0	110.2	476.1	1,263.9
Annual Costs ($ x 10^{-3})							
Capital	12.8	1.9	35.9	10.3	9.9	42.8	113.6
Operation & Maintenance	5.0	0.7	14.0	4.0	3.9	16.7	44.3
Land	0.1			0.1	0.1	0.1	0.4
Sludge Disposal					0.6		0.6
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power		0.3		1.2	1.7	3.5	6.7
Steam							
Waste Acid							
Crystal Disposal							
Chemical							
TOTAL	17.9	2.9	49.9	15.6	16.2	63.1	165.6
Credits							
Scale	39.3						39.3
Sinter							
Oil		1.6					1.6
Acid Recovery							
TOTAL CREDITS	39.3	1.6					40.9
NET TOTAL	-21.4	1.3	49.9	15.6	16.2	63.1	124.7

KEY TO C&TT STEPS

A: Primary Scale Pit
B: Surface Skimming
C: Recycle
D: Roughing Clarification
E: Vacuum Filtration
F: Pressure Filtration

TABLE VIII-17

BPT COST SUMMARY (MILLIONS OF 7/1/78 DOLLARS)
HOT FORMING SUBCATEGORY

	BPT			
	Capital		Annual	
Subdivision	In-Place	Required	In-Place	Required
Primary				
a. Carbon w/o scarfing	34.15	9.85	- 5.29	1.32
b. Carbon w/ scarfing	76.45	20.78	-29.62	2.68
c. Specialty w/o scarfing	6.49	0.76	- 0.15	0.00
d. Specialty w/ scarfing	6.74	0.00	- 0.75	0.00
	123.83	31.39	-35.81	4.00
Section				
a. Carbon	88.95	19.05	- 0.96	2.48
b. Specialty	13.28	4.17	- 0.15	0.30
	102.23	23.22	- 1.11	2.78
Flat				
a. Carbon hot strip & sheet	102.04	23.26	- 4.83	3.06
b. Specialty hot strip & sheet	5.05	0.14	0.23	0.02
c. Carbon plate	13.66	6.49	- 1.23	0.87
d. Specialty plate	3.01	0.18	0.07	0.02
	123.76	30.07	- 5.76	3.97
Pipe & Tube				
a. Carbon	12.76	9.35	1.42	1.23
b. Specialty	3.68	0.00	0.27	0.00
	16.44	9.35	1.69	1.23
Confidential Plants	13.87	0.82	0.21	-0.02
Hot Forming Total	380.13	94.85	-40.78	11.96

TABLE VIII-18

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Primary, Carbon
: Without Scarfers

Model Size - TPD: 3,800
Oper. Days/Year : 260
Turns/Day : 3

C&TT Step	Total BPT	BAT Alternative 1 G	BAT Alternative 1 H	BAT Alternative 1 Total	BAT Alternative 2 Alt. 1 Plus: I	BAT Alternative 2 Alt. 1 Plus: J	BAT Alternative 2 Alt. 1 Plus: Total
Investment ($ x 10^{-3})	2,299.7	740.9	499.0	1,239.9	3,854.2	93.3	5,187.4
Annual Costs ($ x 10^{-3})							
Capital	206.6	66.6	44.9	111.5	346.5	8.4	466.4
Operation & Maintenance	80.4	25.9	17.5	43.4	134.9	3.3	181.6
Land	0.4	0.1	0.1	0.2	0.2	0.1	0.5
Sludge Disposal	3.5						
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power	18.3	28.5		28.5	207.1		235.6
Steam							
Waste Acid							
Crystal Disposal							
Chemical							
TOTAL	309.2	121.1	62.5	183.6	688.7	11.8	884.1
Credits							
Scale	336.3						
Sinter							
Oil	17.4						
Acid Recovery							
TOTAL CREDITS	353.7						
NET TOTAL	-44.5	121.1	62.5	183.6	688.7	11.8	884.1

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT + BAT-1
PSES-3 = BPT + BAT-2

KEY TO C&TT STEPS

G: Cooling Tower
H: Recycle
I: Vapor Compression Distillation
J: Recycle

TABLE VIII-19

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Primary, Carbon
: With Scarfers

Model Size - TPD: 7,400
Oper. Days/Year : 260
Turns/Day : 3

C&TT Step	Total BPT	BAT Alternative 1			BAT Alternative 2 Alt. 1 Plus:		
		G	H	Total	I	J	Total
Investment ($ x 10^{-3})	4,862.5	1,664.7	893.0	2,557.7	7,265.3	308.5	10,131.5
Annual Costs ($ x 10^{-3})							
Capital	437.1	149.7	80.3	230.0	653.1	27.7	910.8
Operation & Maintenance	170.1	58.3	31.3	89.6	254.3	10.8	354.7
Land	0.8	0.1	0.2	0.3	0.3	0.1	0.7
Sludge Disposal	10.0						
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power	28.5	72.1		72.1	595.8		667.9
Steam							
Waste Acid							
Crystal Disposal							
Chemical							
TOTAL	646.5	280.2	111.8	392.0	1,503.5	38.6	1,934.1
Credits							
Scale	1,314.8						
Sinter							
Oil	29.8						
Acid Recovery							
TOTAL CREDITS	1,344.6						
NET TOTAL	-698.1	280.2	111.8	392.0	1,503.5	38.6	1,934.1

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT + BAT-1
PSES-3 = BPT + BAT-2

KEY TO C&TT STEPS

G: Cooling Tower
H: Recycle
I: Vapor Compression Distillation
J: Recycle

TABLE VIII-20

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Primary, Specialty
: Without Scarfers

Model Size - TPD: 1,200
Oper. Days/Year : 260
Turns/Day : 3

C&TT Step	Total BPT	BAT Alternative 1			BAT Alternative 2 Alt. 1 Plus:		
		G	H	Total	I	J	Total
Investment ($ x 10^{-3})	1,360.8	368.0	308.5	676.5	2,242.0	27.2	2,945.7
Annual Costs ($ x 10^{-3})							
Capital	122.3	33.1	27.7	60.8	201.0	2.4	264.8
Operation & Maintenance	47.6	12.9	10.8	23.7	78.5	1.0	103.2
Land	0.4	0.1	0.1	0.2	0.2	0.1	0.5
Sludge Disposal	1.3						
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power	10.2	11.1		11.1	65.7		76.8
Steam							
Waste Acid							
Crystal Disposal							
Chemical							
TOTAL	181.8	57.2	38.6	95.8	346.0	3.5	445.3
Credits							
Scale	104.8						
Sinter							
Oil	5.5						
Acid Recovery							
TOTAL CREDITS	110.3						
NET TOTAL	71.5	57.2	38.6	95.8	346.0	3.5	445.3

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT + BAT-1
PSES-3 = BPT + BAT-2

KEY TO C&TT STEPS

G: Cooling Tower
H: Recycle
I: Vapor Compression Distillation
J: Recycle

TABLE VIII-21

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Primary, Specialty
: With Scarfers

Model Size - TPD: 1,850
Oper. Days/Year : 260
Turns/Day : 3

C&TT Step	Total BPT	BAT Alternative 1 G	BAT Alternative 1 H	BAT Alternative 1 Total	BAT Alternative Alt. 1 Plus: I	BAT Alternative Alt. 1 Plus: J	BAT Alternative Alt. 1 Plus: Total
Investment ($ x 10^{-3})	1,962.9	614.0	407.7	1,021.7	3,165.1	56.5	4,243.3
Annual Costs ($ x 10^{-3})							
Capital	176.5	55.2	36.6	91.8	284.5	5.1	381.4
Operation & Maintenance	68.7	21.5	14.3	35.8	110.8	2.0	148.6
Land	0.4	0.1	0.1	0.2	0.2	0.1	0.5
Sludge Disposal	2.5						
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power	13.7	23.3		23.3	149.1		172.4
Steam							
Waste Acid							
Crystal Disposal							
Chemical							
TOTAL	261.8	100.1	51.0	151.1	544.6	7.2	702.9
Credits							
Scale	323.2						
Sinter							
Oil	7.5						
Acid Recovery							
TOTAL CREDITS	330.7						
NET TOTAL	-68.9	100.1	51.0	151.1	544.6	7.2	702.9

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT + BAT-1
PSES-3 = BPT + BAT-2

KEY TO C&TT STEPS

G: Cooling Tower
H: Recycle
I: Vapor Compression Distillation
J: Recycle

TABLE VIII-22

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Section, Carbon

Model Size - TPD: 3,050
Oper. Days/Year : 260
Turns/Day : 3

		BAT Alternative 1			BAT Alternative 2 Alt. 1 Plus:		
C&TT Step	Total BPT	G	H	Total	I	J	Total
Investment ($ x 10^{-3})	3,985.1	1,114.4	601.0	1,715.4	5,443.2	286.9	7,445.5
Annual Costs ($ x 10^{-3})							
Capital	358.3	100.2	54.0	154.2	489.3	25.8	669.3
Operation & Maintenance	139.5	39.0	21.0	60.0	190.5	10.0	260.5
Land	0.6	0.1	0.1	0.2	0.2	0.1	0.5
Sludge Disposal	7.5						
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power	25.0	51.2		51.2	368.2		419.4
Steam							
Waste Acid							
Crystal Disposal							
Chemical							
TOTAL	530.9	190.5	75.1	265.6	1,048.2	35.9	1,349.7
Credits							
Scale	253.3						
Sinter							
Oil	10.3						
Acid Recovery							
TOTAL CREDITS	263.6						
NET TOTAL	267.3	190.5	75.1	265.6	1,048.2	35.9	1,349.7

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT + BAT-1
PSES-3 = BPT + BAT-2

KEY TO C&TT STEPS

G: Cooling Tower
H: Recycle
I: Vapor Compression Distillation
J: Recycle

TABLE VIII-23

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Section, Specialty

Model Size - TPD: 1,200
Oper. Days/Year : 260
Turns/Day : 3

C&TT Step	Total BPT	BAT Alternative 1			BAT Alternative 2 Alt. 1 Plus:		
		G	H	Total	I	J	Total
Investment ($ x 10^{-3})	1,525.0	482.9	332.5	815.4	2,448.3	33.2	3,296.9
Annual Costs ($ x 10^{-3})							
Capital	137.1	43.4	29.9	73.3	220.1	3.0	296.4
Operation & Maintenance	53.3	16.9	11.6	28.5	85.7	1.2	115.4
Land	0.4	0.1	0.1	0.2	0.2	0.1	0.5
Sludge Disposal	1.7						
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power	11.3	15.1		15.1	90.2		105.3
Steam							
Waste Acid							
Crystal Disposal							
Chemical							
TOTAL	203.8	75.5	41.6	117.1	396.2	4.3	517.6
Credits							
Scale	104.8						
Sinter							
Oil	5.0						
Acid Recovery							
TOTAL CREDITS	109.8						
NET TOTAL	94.0	75.5	41.6	117.1	396.2	4.3	517.6

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT + BAT-1
PSES-3 = BPT + BAT-2

KEY TO C&TT STEPS

G: Cooling Tower
H: Recycle
I: Vapor Compression Distillation
J: Recycle

TABLE VIII-24

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Flat, Carbon
: Hot Strip & Sheet

Model Size - TPD: 7,250
Oper. Days/Year : 260
Turns/Day : 3

C&TT Step	Total BPT	BAT Alternative 1			BAT Alternative 2 Alt. 1 Plus:		
		G	H	Total	I	J	Total
Investment ($ x 10^{-3})	6,588.7	2,639.5	1,301.9	3,941.4	13,937.3	374.1	18,252.8
Annual Costs ($ x 10^{-3})							
Capital	592.4	237.3	117.0	354.3	1,253.0	33.6	1,640.9
Operation & Maintenance	230.6	92.4	45.6	138.0	487.8	13.1	638.9
Land	1.3	0.2	0.2	0.4	0.6	0.1	1.1
Sludge Disposal	18.2						
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power	32.6	124.5		124.5	1,098.7		1,223.2
Steam							
Waste Acid							
Crystal Disposal							
Chemical							
TOTAL	875.1	454.4	162.8	617.2	2,840.1	46.8	3,504.1
Credits							
Scale	585.3						
Sinter							
Oil	20.1						
Acid Recovery							
TOTAL CREDITS	605.4						
NET TOTAL	269.7	454.4	162.8	617.2	2,840.1	46.8	3,504.1

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT + BAT-1
PSES-3 = BPT + BAT-2

KEY TO C&TT STEPS

G: Cooling Tower
H: Recycle
I: Vapor Compression Distillation
J: Recycle

TABLE VIII-25

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Flat, Specialty
: Hot Strip & Sheet

Model Size - TPD: 900
Oper. Days/Year : 260
Turns/Day : 3

C&TT Step	Total BPT	BAT Alternative 1			BAT Alternative 2 Alt. 1 Plus:		
		G	H	Total	I	J	Total
Investment ($ x 10^{-3})	1,871.1	606.4	393.3	999.7	2,999.4	53.5	4,052.6
Annual Costs ($ x 10^{-3})							
Capital	168.2	54.5	35.4	89.9	269.6	4.8	364.3
Operation & Maintenance	65.5	21.2	13.8	35.0	105.0	1.9	141.9
Land	0.4	0.1	0.1	0.2	0.2	0.1	0.5
Sludge Disposal	2.3						
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power	14.2	23.3		23.3	136.3		159.6
Steam							
Waste Acid							
Crystal Disposal							
Chemical							
TOTAL	250.6	99.1	49.3	148.4	511.1	6.8	666.3
Credits							
Scale	74.3						
Sinter							
Oil	2.5						
Acid Recovery							
TOTAL CREDITS	76.8						
NET TOTAL	173.8	99.1	49.3	148.4	511.1	6.8	666.3

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT + BAT-1
PSES-3 = BPT + BAT-2

KEY TO C&TT STEPS

G: Cooling Tower
H: Recycle
I: Vapor Compression Distillation
J: Recycle

TABLE VIII-26

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Flat, Carbon
: Plate

Model Size - TPD: 3,150
Oper. Days/Year : 260
Turns/Day : 3

C&TT Step	Total BPT	BAT Alternative 1 G	BAT Alternative 1 H	BAT Alternative 1 Total	BAT Alternative 2 Alt. 1 Plus: I	BAT Alternative 2 Alt. 1 Plus: J	BAT Alternative 2 Total
Investment ($ x 10^{-3})	2,619.3	849.9	539.6	1,389.5	4,356.1	105.5	5,851.1
Annual Costs ($ x 10^{-3})							
Capital	235.6	76.4	48.5	124.9	391.6	9.5	526.0
Operation & Maintenance	91.6	29.7	18.9	48.6	152.5	3.7	204.8
Land	0.4	0.1	0.1	0.2	0.2	0.1	0.5
Sludge Disposal	4.3						
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power	15.4	36.1		36.1	34.7		70.8
Steam							
Waste Acid							
Crystal Disposal							
Chemical							
TOTAL	347.3	142.3	67.5	209.8	579.0	13.3	802.1
Credits							
Scale	270.8						
Sinter							
Oil	12.7						
Acid Recovery							
TOTAL CREDITS	283.5						
NET TOTAL	63.8	142.3	67.5	209.8	579.0	13.3	802.1

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT + BAT-1
PSES-3 = BPT + BAT-2

KEY TO C&TT STEPS

G: Cooling Tower
H: Recycle
I: Vapor Compression Distillation
J: Recycle

TABLE VIII-27

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Flat, Specialty
: Plate

Model Size - TPD: 1,000
Oper. Days/Year : 260
Turns/Day : 3

C&TT Step	Total BPT	BAT Alternative 1			BAT Alternative 2 Alt. 1 Plus:		
		G	H	Total	I	J	Total
Investment ($ x 10^{-3})	1,111.8	368.0	274.0	642.0	1,920.3	25.5	2,587.8
Annual Costs ($ x 10^{-3})							
Capital	100.0	33.1	24.6	57.7	172.6	2.3	232.6
Operation & Maintenance	39.0	12.9	9.6	22.5	67.2	0.9	90.6
Land	0.4	0.1	0.1	0.2	0.2	0.1	0.5
Sludge Disposal	0.6						
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power	6.0	11.1		11.1	35.5		46.6
Steam							
Waste Acid							
Crystal Disposal							
Chemical							
TOTAL	146.0	57.2	34.3	91.5	275.5	3.3	370.3
Credits							
Scale	87.4						
Sinter							
Oil	5.0						
Acid Recovery							
TOTAL CREDITS	92.4						
NET TOTAL	53.6	57.2	34.3	91.5	275.5	3.3	370.3

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT + BAT-1
PSES-3 = BPT + BAT-2

KEY TO C&TT STEPS

G: Cooling Tower
H: Recycle
I: Vapor Compression Distillation
J: Recycle

TABLE VIII-28

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Pipe & Tube, Carbon

Model Size - TPD: 900
Oper. Days/Year : 260
Turns/Day : 3

C&TT Step	Total BPT	BAT Alternative 1			BAT Alternative 2 Alt. 1 Plus:		
		G	H	Total	I	J	Total
Investment ($ x 10^{-3})	1,571.6	368.0	308.5	676.5	2,744.7	49.0	3,470.2
Annual Costs ($ x 10^{-3})							
Capital	141.2	33.1	27.7	60.8	246.7	4.4	311.9
Operation & Maintenance	55.0	12.9	10.8	23.7	96.1	1.7	121.5
Land	0.4	0.1	0.1	0.2	0.2	0.1	0.5
Sludge Disposal	1.2						
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power	10.7	11.1		11.1	117.5		128.6
Steam							
Waste Acid							
Crystal Disposal							
Chemical							
TOTAL	208.5	57.2	38.6	95.8	460.5	6.2	562.5
Credits							
Scale	8.7						
Sinter							
Oil	2.9						
Acid Recovery							
TOTAL CREDITS	11.6						
NET TOTAL	196.9	57.2	38.6	95.8	460.5	6.2	562.5

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT + BAT-1
PSES-3 = BPT + BAT-2

KEY TO C&TT STEPS

G: Cooling Tower
H: Recycle
I: Vapor Compression Distillation
J: Recycle

TABLE VIII-29

BAT/PSES TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Pipe & Tube, Specialty

Model Size - TPD: 500
Oper. Days/Year : 260
Turns/Day : 3

C&TT Step	Total BPT	BAT Alternative 1			BAT Alternative 2 Alt. 1 Plus:		
		G	H	Total	I	J	Total
Investment ($ x 10^{-3})	1,263.9	368.0	274.0	642.0	2,242.0	27.2	2,911.2
Annual Costs ($ x 10^{-3})							
Capital	113.6	33.1	24.6	57.7	201.6	2.4	261.7
Operation & Maintenance	44.3	12.9	9.6	22.5	78.5	1.0	102.0
Land	0.4	0.1	0.1	0.2	0.2	0.1	0.5
Sludge Disposal	0.6						
Hazardous Waste Disposal							
Oil Disposal							
Energy & Power	6.7	11.1		11.1	65.1		76.2
Steam							
Waste Acid							
Crystal Disposal							
Chemical							
TOTAL	165.6	57.2	34.3	91.5	345.4	3.5	440.4
Credits							
Scale	39.3						
Sinter							
Oil	1.6						
Acid Recovery							
TOTAL CREDITS	40.9						
NET TOTAL	124.7	57.2	34.3	91.5	345.4	3.5	440.4

KEY TO TREATMENT ALTERNATIVES

PSES-1 = BPT
PSES-2 = BPT + BAT-1
PSES-3 = BPT + BAT-2

KEY TO C&TT STEPS

G: Cooling Tower
H: Recycle
I: Vapor Compression Distillation
J: Recycle

TABLE VIII-30

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Primary, Carbon
: Without Scarfers

Model Size-TPD : 3,800
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	NSPS/PSNS Alternative 1								
	A	B	C	D	E	F	G	H	Total
Investment ($ x 10^{-3})	268.3	25.0	601.0	315.2	180.2	740.9	499.0	238.6	2,868.2
Annual Costs ($ x 10^{-3})									
Capital	24.1	2.2	54.0	28.3	16.2	66.6	44.9	21.4	257.7
Operation & Maintenance	9.4	0.9	21.0	11.0	6.3	25.9	17.5	8.3	100.3
Land	0.1			0.1	0.1	0.1		0.1	0.5
Sludge Disposal					3.5				3.5
Hazardous Waste Disposal									
Oil Disposal									
Energy & Power		0.3		2.3	4.1	29.1		1.7	37.5
Steam									
Waste Acid									
Crystal Disposal									
Chemical									
TOTAL	33.6	3.4	75.0	41.7	30.2	121.7	62.4	31.5	399.5
Credits									
Scale	336.3								336.3
Sinter									
Oil		17.4							17.4
Acid Recovery									
TOTAL CREDITS	336.3	17.4							353.7
NET TOTAL	-302.7	-14.0	75.0	41.7	30.2	121.7	62.4	31.5	45.8

TABLE VIII-30
NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS
PAGE 2

C&TT Step	NSPS/PSNS Alternative 2 Alternative 1 Plus: I	 J	 Total
Investment ($ x 10^{-3})	3,854.2	93.3	6,815.7
Annual Cost ($ x 10^{-3})			
Capital	346.5	8.4	612.6
Operation & Maintenance	134.9	3.3	238.5
Land	0.2	0.1	0.8
Sludge Disposal			3.5
Hazardous Waste Disposal			
Oil Disposal			
Energy & Power	207.1		244.6
Steam			
Waste Acid			
Crystal Disposal			
Chemical			
TOTAL	688.7	11.8	1,100.0
Credits			
Scale			336.3
Sinter			
Oil			17.4
Acid Recovery			
TOTAL CREDITS			353.7
NET TOTAL	688.7	11.8	746.3

KEY TO C&TT STEPS

A: Primary Scale Pit
B: Surface Skimming
C: Recycle
D: Roughing Clarification
E: Vacuum Filtration
F: Cooling Tower
G: Recycle
H: Pressure Filtration
I: Vapor Compression Distillation
J: Recycle

TABLE VIII-31

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Primary, Carbon
: With Scarfers

Model Size-TPD : 7,400
Oper. Days/Year: 260
Turns/Day : 3

	NSPS/PSNS Alternative 1								
C&TT Step	A	B	C	D	E	F	G	H	Total
Investment ($ x 10^{-3})	423.5	60.5	1,167.4	492.0	327.1	1,664.7	893.0	539.3	5,567.5
Annual Costs ($ x 10^{-3})									
Capital	38.1	5.4	105.0	44.2	29.4	149.7	80.3	48.5	500.6
Operation & Maintenance	14.8	2.1	40.9	17.2	11.4	58.3	31.3	18.9	194.9
Land	0.2			0.2	0.1	0.1		0.1	0.7
Sludge Disposal					10.0				10.0
Hazardous Waste Disposal									
Oil Disposal									
Energy & Power		0.6		2.3	5.2	69.8		4.7	82.6
Steam									
Waste Acid									
Crystal Disposal									
Chemical									
TOTAL	53.1	8.1	145.9	63.9	56.1	277.9	111.6	72.2	788.8
Credits									
Scale	1,314.8								1,314.8
Sinter									
Oil		29.8							29.8
Acid Recovery									
TOTAL CREDITS	1,314.8	29.8							1,344.6
NET TOTAL	-1,261.7	-21.7	145.9	63.9	56.1	277.9	111.6	72.2	-555.8

TABLE VIII-31
NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS
PAGE 2

C&TT Step	NSPS/PSNS Alternative 2		
	Alternative 1 Plus:		
	I	J	Total
Investment ($ x 10^{-3})	7,265.3	308.5	13,141.3
Annual Cost ($ x 10^{-3})			
Capital	653.1	27.7	1,181.4
Operation & Maintenance	254.3	10.8	460.0
Land	0.3	0.1	1.1
Sludge Disposal			10.0
Hazardous Waste Disposal			
Oil Disposal			
Energy & Power	595.8		678.4
Steam			
Waste Acid			
Crystal Disposal			
Chemical			
TOTAL	1,503.5	38.6	2,330.9
Credits			
Scale			1,314.8
Sinter			
Oil			29.8
Acid Recovery			
TOTAL CREDITS			1,344.6
NET TOTAL	1,503.5	38.6	986.3

KEY TO C&TT STEPS

A: Primary Scale Pit
B: Surface Skimming
C: Recycle
D: Roughing Clarification
E: Vacuum Filtration

F: Cooling Tower
G: Recycle
H: Pressure Filtration
I: Vapor Compression Distillation
J: Recycle

TABLE VIII-32

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Primary, Specialty
: Without Scarfers

Model Size-TPD : 1,200
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	NSPS/PSNS Alternative 1								
	A	B	C	D	E	F	G	H	Total
Investment ($ x 10^{-3})	142.5	21.0	374.1	348.8	126.0	368.0	308.5	114.6	1,803.5
Annual Costs ($ x 10^{-3})									
Capital	12.8	1.9	33.6	31.4	11.3	33.1	27.7	10.3	162.1
Operation & Maintenance	5.0	0.7	13.1	12.2	4.4	12.9	10.8	4.0	63.1
Land	0.1			0.3	0.1	0.1		0.1	0.7
Sludge Disposal					1.3				1.3
Hazardous Waste Disposal									
Oil Disposal									
Energy & Power		0.3		1.2	3.5	11.6		0.6	17.2
Steam									
Waste Acid									
Crystal Disposal									
Chemical									
TOTAL	17.9	2.9	46.7	45.1	20.6	57.7	38.5	15.0	244.4
Credits									
Scale	104.8								104.8
Sinter									
Oil		5.5							5.5
Acid Recovery									
TOTAL CREDITS	104.8	5.5							110.3
NET TOTAL	-86.9	-2.6	46.7	45.1	20.6	57.7	38.5	15.0	134.1

TABLE VIII-32
NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS
PAGE 2

C&TT Step	NSPS/PSNS Alternative 2 Alternative 1 Plus: I	 J	 Total
Investment ($ x 10^{-3})	2,242.0	27.2	4,072.7
Annual Cost ($ x 10^{-3})			
Capital	201.0	2.4	365.5
Operation & Maintenance	78.5	1.0	142.6
Land	0.2	0.1	1.0
Sludge Disposal			1.3
Hazardous Waste Disposal			
Oil Disposal			
Energy & Power	65.7		82.9
Steam			
Waste Acid			
Crystal Disposal			
Chemical			
TOTAL	346.0	3.5	593.9
Credits			
Scale			104.8
Sinter			
Oil			5.5
Acid Recovery			
TOTAL CREDITS			110.3
NET TOTAL	346.0	3.5	483.6

KEY TO C&TT STEPS

A: Primary Scale Pit
B: Surface Skimming
C: Recycle
D: Roughing Clarification
E: Vacuum Filtration
F: Cooling Tower
G: Recycle
H: Pressure Filtration
I: Vapor Compression Distillation
J: Recycle

TABLE VIII-33

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Primary, Specialty
: With Scarfers

Model Size-TPD : 1,850
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	NSPS/PSNS Alternative 1								
	A	B	C	D	E	F	G	H	Total
Investment ($ x 10^{-3})	220.3	25.0	538.0	498.4	162.5	614.0	407.7	144.3	2,610.2
Annual Costs ($ x 10^{-3})									
Capital	19.8	2.2	48.4	44.8	14.6	55.2	36.6	13.0	234.6
Operation & Maintenance	7.7	0.9	18.8	17.4	5.7	21.5	14.3	5.0	91.3
Land	0.1			0.3	0.1	0.1		0.1	0.7
Sludge Disposal					2.5				2.5
Hazardous Waste Disposal									
Oil Disposal									
Energy & Power		0.3		1.7	3.5	23.3		0.6	29.4
Steam									
Waste Acid									
Crystal Disposal									
Chemical									
TOTAL	27.6	3.4	67.2	64.2	26.4	100.1	50.9	18.7	358.5
Credits									
Scale	323.2								323.2
Sinter									
Oil		7.5							7.5
Acid Recovery									
TOTAL CREDITS	323.2	7.5							330.7
NET TOTAL	-295.6	-4.1	67.2	64.2	26.4	100.1	50.9	18.7	27.8

TABLE VIII-33
NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS
PAGE 2

C&TT Step	NSPS/PSNS Alternative 2 Alternative 1 Plus: I	 J	 Total
Investment ($ x 10^{-3})	3,165.1	56.5	5,831.8
Annual Cost ($ x 10^{-3})			
Capital	284.5	5.1	524.2
Operation & Maintenance	110.8	2.0	204.1
Land	0.2	0.1	1.0
Sludge Disposal			2.5
Hazardous Waste Disposal			
Oil Disposal			
Energy & Power	149.1		178.5
Steam			
Waste Acid			
Crystal Disposal			
Chemical			
TOTAL	544.6	7.2	910.3
Credits			
Scale			323.2
Sinter			
Oil			7.5
Acid Recovery			
TOTAL CREDITS			330.7
NET TOTAL	544.6	7.2	579.6

KEY TO C&TT STEPS

A: Primary Scale Pit
B: Surface Skimming
C: Recycle
D: Roughing Clarification
E: Vacuum Filtration
F: Cooling Tower
G: Recycle
H: Pressure Filtration
I: Vapor Compression Distillation
J: Recycle

VIII-34
NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS
PAGE 2

C&TT Step	NSPS/PSNS Alternative 2		
	Alternative 1 Plus:		
	I	J	Total
Investment ($ x 10^{-3})	5,443.2	286.9	9,893.5
Annual Cost ($ x 10^{-3})			
Capital	489.3	25.8	889.4
Operation & Maintenance	190.5	10.0	346.2
Land	0.2	0.1	1.0
Sludge Disposal			7.5
Hazardous Waste Disposal			
Oil Disposal			
Energy & Power	368.2		430.5
Steam			
Waste Acid			
Crystal Disposal			
Chemical			
TOTAL	1,048.2	35.9	1,674.6
Credits			
Scale			253.3
Sinter			
Oil			10.3
Acid Recovery			
TOTAL CREDITS			263.6
NET TOTAL	1,048.2	35.9	1,411.0

KEY TO C&TT STEPS

A: Primary Scale Pit
B: Surface Skimming
C: Recycle
D: Roughing Clarification
E: Vacuum Filtration
F: Cooling Tower
G: Recycle
H: Pressure Filtration
I: Vapor Compression Distillation
J: Recycle

TABLE VIII-35

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Section, Specialty

Model Size-TPD : 1,200
Oper. Days/Year: 260
Turns/Day : 3

	NSPS/PSNS Alternative 1								
C&TT Step	A	B	C	D	E	F	G	H	Total
Investment ($ x 10^{-3})	162.6	23.0	410.5	201.2	138.2	482.9	332.5	139.6	1,890.5
Annual Costs ($ x 10^{-3})									
Capital	14.6	2.1	36.9	18.1	12.4	43.4	29.9	12.6	170.0
Operation & Maintenance	5.7	0.8	14.4	7.0	4.8	16.9	11.6	4.9	66.1
Land	0.1			0.1	0.1	0.1		0.1	0.5
Sludge Disposal					1.7				1.7
Hazardous Waste Disposal									
Oil Disposal									
Energy & Power		0.3		1.7	3.5	15.1		0.6	21.2
Steam									
Waste Acid									
Crystal Disposal									
Chemical									
TOTAL	20.4	3.2	51.3	26.9	22.5	75.5	41.5	18.2	259.5
Credits									
Scale	104.8								104.8
Sinter									
Oil		5.0							5.0
Acid Recovery									
TOTAL CREDITS	104.8	5.0							109.8
NET TOTAL	-84.4	-1.8	51.3	26.9	22.5	75.5	41.5	18.2	149.7

TABLE VIII-35
NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS
PAGE 2

	NSPS/PSNS Alternative 2		
	Alternative 1 Plus:		
C&TT Step	I	J	Total
Investment ($ x 10^{-3})	2,448.3	33.2	4,372.0
Annual Cost ($ x 10^{-3})			
Capital	220.1	3.0	393.1
Operation & Maintenance	85.7	1.2	153.0
Land	0.2	0.1	0.8
Sludge Disposal			1.7
Hazardous Waste Disposal			
Oil Disposal			
Energy & Power	90.2		111.4
Steam			
Waste Acid			
Crystal Disposal			
Chemical			
TOTAL	396.2	4.3	660.0
Credits			
Scale			104.8
Sinter			
Oil			5.0
Acid Recovery			
TOTAL CREDITS			109.8
NET TOTAL	396.2	4.3	550.2

KEY TO C&TT STEPS

A: Primary Scale Pit
B: Surface Skimming
C: Recycle
D: Roughing Clarification
E: Vacuum Filtration
F: Cooling Tower
G: Recycle
H: Pressure Filtration
I: Vapor Compression Distillation
J: Recycle

TABLE VIII-36

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Flat, Carbon
: Hot Strip & Sheet

Model Size-TPD : 7,250
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	NSPS/PSNS Alternative 1								
	A	B	C	D	E	F	G	H	Total
Investment ($ x 10^{-3})	684.8	103.7	1,856.2	739.5	347.0	2,639.5	1,301.9	641.4	8,314.0
Annual Costs ($ x 10^{-3})									
Capital	61.6	9.3	166.9	66.5	31.2	237.3	117.0	57.7	747.5
Operation & Maintenance	24.0	3.6	65.0	25.9	12.1	92.4	45.6	22.4	291.0
Land	0.3			0.4	0.1	0.3		0.1	1.2
Sludge Disposal					18.2				18.2
Hazardous Waste Disposal									
Oil Disposal									
Energy & Power		1.2		2.3	5.8	116.3		7.0	132.6
Steam									
Waste Acid									
Crystal Disposal									
Chemical									
TOTAL	85.9	14.1	231.9	95.1	67.4	446.3	162.6	87.2	1,190.5
Credits									
Scale	585.3								585.3
Sinter									
Oil		20.1							20.1
Acid Recovery									
TOTAL CREDITS	585.3	20.1							605.4
NET TOTAL	-499.4	-6.0	231.9	95.1	67.4	446.3	162.6	87.2	585.1

TABLE VIII-36
NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS
PAGE 2

C&TT Step	NSPS/PSNS Alternative 2		
	Alternative 1 Plus:		
	I	J	Total
Investment ($ x 10^{-3})	13,937.3	374.1	22,625.4
Annual Cost ($ x 10^{-3})			
Capital	1,253.0	33.6	2,034.1
Operation & Maintenance	487.8	13.1	791.9
Land	0.6	0.1	1.9
Sludge Disposal			18.2
Hazardous Waste Disposal			
Oil Disposal			
Energy & Power	1,098.7		1,231.3
Steam			
Waste Acid			
Crystal Disposal			
Chemical			
TOTAL	2,840.1	46.8	4,077.4
Credits			
Scale			585.3
Sinter			
Oil			20.1
Acid Recovery			
TOTAL CREDITS			605.4
NET TOTAL	2,840.1	46.8	3,472.0

KEY TO C&TT STEPS

A: Primary Scale Pit
B: Surface Skimming
C: Recycle
D: Roughing Clarification
E: Vacuum Filtration

F: Cooling Tower
G: Recycle
H: Pressure Filtration
I: Vapor Compression Distillation
J: Recycle

TABLE VIII-37

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Flat, Specialty
: Hot Strip & Sheet

Model Size-TPD : 900
Oper. Days/Year: 260
Turns/Day : 3

	NSPS/PSNS Alternative 1								
C&TT Step	A	B	C	D	E	F	G	H	Total
Investment ($ x 10^{-3})	208.9	24.0	505.3	249.2	153.5	606.4	393.3	177.7	2,318.3
Annual Costs ($ x 10^{-3})									
Capital	18.8	2.2	45.4	22.4	13.8	54.5	35.4	16.0	208.5
Operation & Maintenance	7.3	0.8	17.7	8.7	5.4	21.2	13.8	6.2	81.1
Land	0.1			0.1	0.1	0.1		0.1	0.5
Sludge Disposal					2.3				2.3
Hazardous Waste Disposal									
Oil Disposal									
Energy & Power		0.3		1.7	3.5	23.3		1.2	30.0
Steam									
Waste Acid									
Crystal Disposal									
Chemical									
TOTAL	26.2	3.3	63.1	32.9	25.1	99.1	49.2	23.5	322.4
Credits									
Scale	74.3								74.3
Sinter									
Oil		2.5							2.5
Acid Recovery									
TOTAL CREDITS	74.3	2.5							76.8
NET TOTAL	-48.1	0.8	63.1	32.9	25.1	99.1	49.2	23.5	245.6

TABLE VIII-37
NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS
PAGE 2

C&TT Step	NSPS/PSNS Alternative 2 Alternative 1 Plus: I	J	Total
Investment ($ x 10^{-3})	2,999.4	53.5	5,371.2
Annual Cost ($ x 10^{-3})			
Capital	269.6	4.8	482.9
Operation & Maintenance	105.0	1.9	188.0
Land	0.2	0.1	0.8
Sludge Disposal			2.3
Hazardous Waste Disposal			
Oil Disposal			
Energy & Power	136.3		166.3
Steam			
Waste Acid			
Crystal Disposal			
Chemical			
TOTAL	511.1	6.8	840.3
Credits			
Scale			74.3
Sinter			
Oil			2.5
Acid Recovery			
TOTAL CREDITS			76.8
NET TOTAL	511.1	6.8	763.5

KEY TO C&TT STEPS

A: Primary Scale Pit
B: Surface Skimming
C: Recycle
D: Roughing Clarification
E: Vacuum Filtration
F: Cooling Tower
G: Recycle
H: Pressure Filtration
I: Vapor Compression Distillation
J: Recycle

TABLE VIII-38

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Flat, Carbon
: Plate

Model Size-TPD : 3,150
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	NSPS/PSNS Alternative 1								
	A	B	C	D	E	F	G	H	Total
Investment ($ x 10^{-3})	329.0	26.8	621.4	361.5	241.0	849.9	539.6	289.0	3,258.2
Annual Costs ($ x 10^{-3})									
Capital	29.6	2.4	55.9	32.5	21.7	76.4	48.5	26.0	293.0
Operation & Maintenance	11.5	0.9	21.7	12.7	8.4	29.7	18.9	10.1	113.9
Land	0.1			0.1	0.1	0.1		0.1	0.5
Sludge Disposal					4.3				4.3
Hazardous Waste Disposal									
Oil Disposal									
Energy & Power		0.3		2.3	4.1	34.9		2.3	43.9
Steam									
Waste Acid									
Crystal Disposal									
Chemical									
TOTAL	41.2	3.6	77.6	47.6	38.6	141.1	67.4	38.5	455.6
Credits									
Scale	270.8								270.8
Sinter									
Oil		12.7							12.7
Acid Recovery									
TOTAL CREDITS	270.8	12.7							283.5
NET TOTAL	-229.6	-9.1	77.6	47.6	38.6	141.1	67.4	38.5	172.1

TABLE VIII-38
NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS
PAGE 2

C&TT Step	NSPS/PSNS Alternative 2		
	Alternative 1 Plus:		
	I	J	Total
Investment ($ x 10^{-3})	4,356.1	105.5	7,719.8
Annual Cost ($ x 10^{-3})			
Capital	391.6	9.5	694.1
Operation & Maintenance	152.5	3.7	270.1
Land	0.2	0.1	0.8
Sludge Disposal			4.3
Hazardous Waste Disposal			
Oil Disposal			
Energy & Power	34.7		78.6
Steam			
Waste Acid			
Crystal Disposal			
Chemical			
TOTAL	579.0	13.3	1,047.9
Credits			
Scale			270.8
Sinter			
Oil			12.7
Acid Recovery			
TOTAL CREDITS			283.5
NET TOTAL	579.0	13.3	764.4

KEY TO C&TT STEPS

A: Primary Scale Pit
B: Surface Skimming
C: Recycle
D: Roughing Clarification
E: Vacuum Filtration
F: Cooling Tower
G: Recycle
H: Pressure Filtration
I: Vapor Compression Distillation
J: Recycle

TABLE VIII-39

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Flat, Specialty
: Plate

Model Size-TPD : 1,000
Oper. Days/Year: 260
Turns/Day : 3

	NSPS/PSNS Alternative 1								
C&TT Step	A	B	C	D	E	F	G	H	Total
Investment ($ x 10^{-3})	113.0	19.9	308.5	111.2	98.8	368.0	274.0	49.5	1,342.9
Annual Costs ($ x 10^{-3})									
Capital	10.2	1.8	27.7	10.0	8.9	33.1	24.6	4.4	120.7
Operation & Maintenance	4.0	0.7	10.8	3.9	3.5	12.9	9.6	1.7	47.1
Land	0.1			0.1	0.1	0.1		0.1	0.5
Sludge Disposal					0.6				0.6
Hazardous Waste Disposal									
Oil Disposal									
Energy & Power		0.2		0.6	1.7	11.6		0.3	14.4
Steam									
Waste Acid									
Crystal Disposal									
Chemical									
TOTAL	14.3	2.7	38.5	14.6	14.8	57.7	34.2	6.5	183.3
Credits									
Scale	87.4								87.4
Sinter									
Oil		5.0							5.0
Acid Recovery									
TOTAL CREDITS	87.4	5.0							92.4
NET TOTAL	-73.1	-2.3	38.5	14.6	14.8	57.7	34.2	6.5	90.9

TABLE VIII-39
NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS
PAGE 2

C&TT Step	NSPS/PSNS Alternative 2		
	Alternative 1 Plus:		
	I	J	Total
Investment ($ x 10^{-3})	1,920.3	25.5	3,288.7
Annual Cost ($ x 10^{-3})			
Capital	172.6	2.3	295.6
Operation & Maintenance	67.2	0.9	115.2
Land	0.2	0.1	0.8
Sludge Disposal			0.6
Hazardous Waste Disposal			
Oil Disposal			
Energy & Power	35.5		49.9
Steam			
Waste Acid			
Crystal Disposal			
Chemical			
TOTAL	275.5	3.3	462.1
Credits			
Scale			87.4
Sinter			
Oil			5.0
Acid Recovery			
TOTAL CREDITS			92.4
NET TOTAL	275.5	3.3	369.7

KEY TO C&TT STEPS

A: Primary Scale Pit
B: Surface Skimming
C: Recycle
D: Roughing Clarification
E: Vacuum Filtration
F: Cooling Tower
G: Recycle
H: Pressure Filtration
I: Vapor Compression Distillation
J: Recycle

TABLE VIII-40

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Pipe & Tube, Carbon

Model Size-TPD : 900
Oper. Days/Year: 260
Turns/Day : 3

	NSPS/PSNS Alternative 1								
C&TT Step	A	B	C	D	E	F	G	H	Total
Investment ($ x 10^{-3})	181.9	23.0	537.0	163.7	126.0	368.0	308.5	162.6	1,870.7
Annual Costs ($ x 10^{-3})									
Capital	16.3	2.1	48.3	14.7	11.3	33.1	27.7	14.6	168.1
Operation & Maintenance	6.4	0.8	18.8	5.7	4.4	12.9	10.8	5.7	65.5
Land	0.1			0.1	0.1	0.1		0.1	0.5
Sludge Disposal					1.2				1.2
Hazardous Waste Disposal									
Oil Disposal									
Energy & Power		0.3		1.7	2.9	11.6		0.6	17.1
Steam									
Waste Acid									
Crystal Disposal									
Chemical									
TOTAL	22.8	3.2	67.1	22.2	19.9	57.7	38.5	21.0	252.4
Credits									
Scale	8.7								8.7
Sinter									
Oil		2.9							2.9
Acid Recovery									
TOTAL CREDITS	8.7	2.9							11.6
NET TOTAL	14.1	0.3	67.1	22.2	19.9	57.7	38.5	21.0	240.8

TABLE VIII-40
NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS
PAGE 2

C&TT Step	NSPS/PSNS Alternative 2 Alternative 1 Plus: I	J	Total
Investment ($ x 10^{-3})	2,744.7	49.0	4,664.4
Annual Cost ($ x 10^{-3})			
Capital	246.7	4.4	419.2
Operation & Maintenance	96.1	1.7	163.3
Land	0.2	0.1	0.8
Sludge Disposal			1.2
Hazardous Waste Disposal			
Oil Disposal			
Energy & Power	117.5		134.6
Steam			
Waste Acid			
Crystal Disposal			
Chemical			
TOTAL	460.5	6.2	719.1
Credits			
Scale			8.7
Sinter			
Oil			2.9
Acid Recovery			
TOTAL CREDITS			11.6
NET TOTAL	460.5	6.2	707.5

KEY TO C&TT STEPS

A: Primary Scale Pit
B: Surface Skimming
C: Recycle
D: Roughing Clarification
E: Vacuum Filtration
F: Cooling Tower
G: Recycle
H: Pressure Filtration
I: Vapor Compression Distillation
J: Recycle

TABLE VIII-41

NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Hot Forming
Subdivision: Pipe & Tube, Specialty

Model Size-TPD : 500
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	NSPS/PSNS Alternative 1								
	A	B	C	D	E	F	G	H	Total
Investment ($ x 10^{-3})	142.5	21.0	399.1	115.0	110.2	368.0	274.0	114.6	1,544.4
Annual Costs ($ x 10^{-3})									
Capital	12.8	1.9	35.9	10.3	9.9	33.1	24.6	10.3	138.8
Operation & Maintenance	5.0	0.7	14.0	4.0	3.9	12.9	9.6	4.0	54.1
Land	0.1			0.1	0.1	0.1		0.1	0.5
Sludge Disposal					0.6				0.6
Hazardous Waste Disposal									
Oil Disposal									
Energy & Power		0.3		1.2	1.7	10.5		0.6	14.3
Steam									
Waste Acid									
Crystal Disposal									
Chemical									
TOTAL	17.9	2.9	49.9	15.6	16.2	56.6	34.2	15.0	208.3
Credits									
Scale	39.3								39.3
Sinter									
Oil		1.6							1.6
Acid Recovery									
TOTAL CREDITS	39.3	1.6							40.9
NET TOTAL	-21.4	1.3	49.9	15.6	16.2	56.6	34.2	15.0	167.4

TABLE VIII-41
NSPS/PSNS TREATMENT MODEL COSTS: BASIS 7/1/78 DOLLARS
PAGE 2

C&TT Step	NSPS/PSNS Alternative 2		
	Alternative 1 Plus:		
	I	J	Total
Investment ($ x 10^{-3})	2,242.0	27.2	3,813.6
Annual Cost ($ x 10^{-3})			
Capital	201.6	2.4	342.8
Operation & Maintenance	78.5	1.0	133.6
Land	0.2	0.1	0.8
Sludge Disposal			0.6
Hazardous Waste Disposal			
Oil Disposal			
Energy & Power	65.1		79.4
Steam			
Waste Acid			
Crystal Disposal			
Chemical			
TOTAL	345.4	3.5	557.2
Credits			
Scale			39.3
Sinter			
Oil			1.6
Acid Recovery			
TOTAL CREDITS			40.9
NET TOTAL	345.4	3.5	516.3

KEY TO C&TT STEPS

A:	Primary Scale Pit	F:	Cooling Tower
B:	Surface Skimming	G:	Recycle
C:	Recycle	H:	Pressure Filtration
D:	Roughing Clarification	I:	Vapor Compression Distillation
E:	Vacuum Filtration	J:	Recycle

TABLE VIII-42

ENERGY REQUIREMENTS SUMMARY
HOT FORMING SUBCATEGORY

SUBDIVISION	No. of Plants	BPT Model Plant kwh	BPT Subcategory kwh	BAT ALT No. 1 Model Plant kwh	BAT ALT No. 1 Subcategory kwh	BAT ALT No. 2 Model Plant kwh	BAT ALT No. 2 Subcategory kwh
PRIMARY							
1. Carbon wo/ scarfing	31	$0.73x10^6$	$22.7x10^6$	$1.14x10^6$	$35.3x10^6$	$9.42x10^6$	$292x10^6$
2. Carbon w/ scarfing	30	$1.14x10^6$	$34.2x10^6$	$2.88x10^6$	$86.4x10^6$	$26.7x10^6$	$801x10^6$
3. Specialty wo/ scarfing	12	$0.41x10^6$	$4.90x10^6$	$0.44x10^6$	$5.28x10^6$	$3.07x10^6$	$36.8x10^6$
4. Specialty w/ scarfing	5	$0.55x10^6$	$2.74x10^6$	$0.93x10^6$	$4.65x10^6$	$6.90x10^6$	$34.5x10^6$
SECTION							
1. Carbon	52	$1.12x 10^6$	$58.2x10^6$	$2.23x10^6$	$116x10^6$	$17.0x10^6$	$884x10^6$
2. Specialty	20	$0.45x 10^6$	$9.04x10^6$	$0.60x10^6$	$12.0x10^6$	$4.21x10^6$	$84.2x10^6$
FLAT							
1. Carbon Hot Strip & Sheet	30	$1.30x10^6$	$39.1x10^6$	$4.98x10^6$	$149x10^6$	$48.9x10^6$	$1467x10^6$
2. Specialty Hot Strip & Sheet	7	$0.57x10^6$	$3.98x10^6$	$0.93x10^6$	$6.51x10^6$	$6.38x10^6$	$44.7x10^6$
3. Carbon Plate	11	$0.62x10^6$	$6.78x10^6$	$1.44x10^6$	$15.8x10^6$	$2.83x10^6$	$31.1x10^6$
4. Specialty Plate	5	$0.24x10^6$	$1.20x10^6$	$0.44x10^6$	$2.20x10^6$	$1.86x10^6$	$9.30x10^6$
PIPE & TUBE							
1. Carbon	25	$0.43x10^6$	$10.7x10^6$	$0.44x10^6$	$11.0x10^6$	$5.14x10^6$	$129x10^6$
2. Specialty	8	$0.27x10^6$	$2.14x10^6$	$0.44x10^6$	$3.52x10^6$	$3.05x10^6$	$24.4x10^6$

TABLE VIII-43

PSES ENERGY REQUIREMENTS SUMMARY
HOT FORMING SUBCATEGORY

SUBDIVISION	No. of Plants	PSES No. 1 Model Plant kwh	PSES No. 1 Subcategory kwh	PSES No. 2 Model Plant kwh	PSES No. 2 Subcategory kwh	PSES No. 3 Model Plant kwh	PSES No. 3 Subcategory kwh
PRIMARY							
1. Carbon wo/ scarfing	2	$0.73x10^6$	$1.46x10^6$	$1.14x10^6$	$2.28x10^6$	$9.42x10^6$	$18.8x10^6$
2. Carbon w/ scarfing	2	$1.14x10^6$	$2.28x10^6$	$2.88x10^6$	$5.76x10^6$	$26.7x10^6$	$53.4x10^6$
3. Specialty wo/ scarfing	2	$0.41x10^6$	$0.82x10^6$	$0.44x10^6$	$0.88x10^6$	$3.07x10^6$	$6.14x10^6$
4. Specialty w/ scarfing	0	$0.55x10^6$	0	$0.93x10^6$	0	$6.90x10^6$	0
SECTION							
1. Carbon	7	$1.12x\ 10^6$	$7.84x10^6$	$2.23x10^6$	$15.6x10^6$	$17.0x10^6$	$119x10^6$
2. Speciality	1	$0.45x\ 10^6$	$0.45x10^6$	$0.60x10^6$	$0.60x10^6$	$4.21x10^6$	$4.21x10^6$
FLAT							
1. Carbon Hot Strip & Sheet	2	$1.30x10^6$	$2.60x10^6$	$4.98x10^6$	$9.96x10^6$	$48.9x10^6$	$97.8x10^6$
2. Specialty Hot Strip & Sheet	0	$0.57x10^6$	0	$0.93x10^6$	0	$6.38x10^6$	0
3. Carbon Plate	1	$0.62x10^6$	$0.62x10^6$	$1.44x10^6$	$1.44x10^6$	$2.83x10^6$	$2.83x10^6$
4. Specialty Plate	0	$0.24x10^6$	0	$0.44x10^6$	0	$1.86x10^6$	0
PIPE & TUBE							
1. Carbon	1	$0.43x10^6$	$0.43x10^6$	$0.44x10^6$	$0.44x10^6$	$5.14x10^6$	$5.14x10^6$
2. Specialty	0	$0.27x10^6$	0	$0.44x10^6$	0	$3.05x10^6$	0

TABLE VIII-44

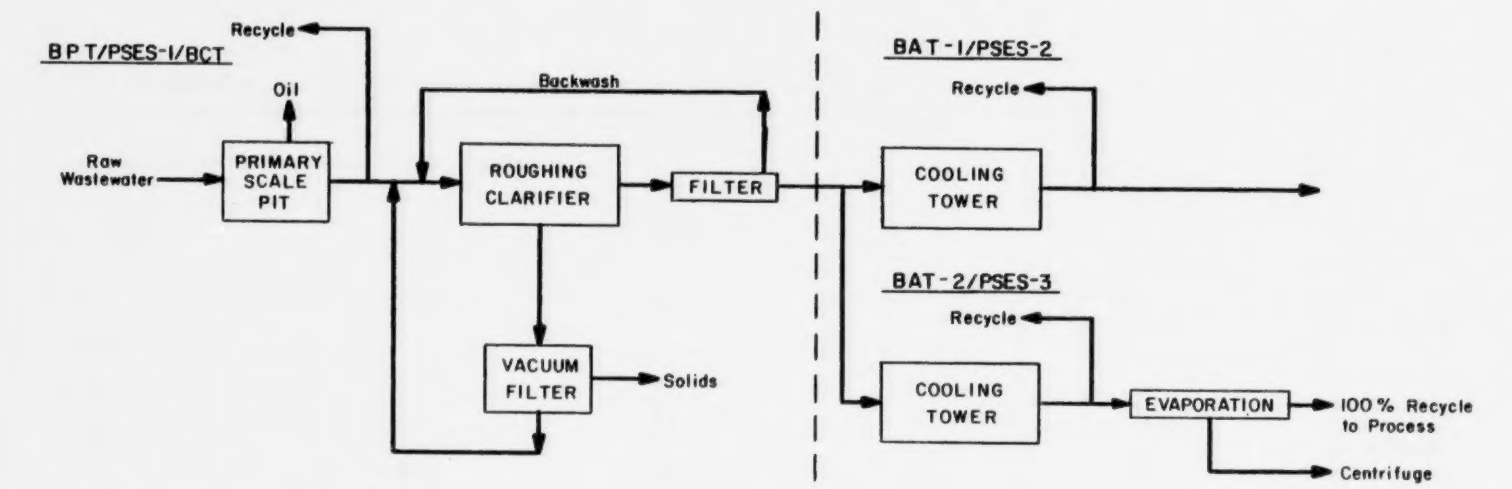
BPT/PSES-1 SOLID WASTE GENERATION SUMMARY(1)
HOT FORMING SUBCATEGORY

SUBDIVISION	BPT		
	No. of Plants	Model Plant tons/yr	Subcategory tons/yr
Primary			
1. Carbon wo/ scarfing	31	$20.7 \times 10^3 (20.0 \times 10^3)$	6.4×10^5
2. Carbon w/ scarfing	30	$80.3 \times 10^3 (78.3 \times 10^3)$	24.1×10^5
3. Specialty wo/ scarfing	12	$19.7 \times 10^3 (19.2 \times 10^3)$	2.4×10^5
4. Specialty w/ scarfing	5	$6.5 \times 10^3 (6.2 \times 10^3)$	0.32×10^5
Section			
1. Carbon	52	$16.6 \times 10^3 (15.1 \times 10^3)$	8.6×10^5
2. Specialty	20	$6.6 \times 10^3 (6.2 \times 10^3)$	1.3×10^5
Flat			
1. Carbon Hot Strip & Sheet	30	$38.5 \times 10^3 (34.8 \times 10^3)$	11.6×10^5
2. Specialty Hot Strip & Sheet	7	$4.9 \times 10^3 (4.4 \times 10^3)$	0.34×10^5
3. Carbon Plate	11	$17.0 \times 10^3 (16.1 \times 10^3)$	1.9×10^5
4. Specialty Plate	5	$5.3 \times 10^3 (5.2 \times 10^3)$	0.27×10^5
Pipe & Wire			
1. Carbon	25	$0.76 \times 10^3 (0.52 \times 10^3)$	0.19×10^5
2. Specialty	8	$2.5 \times 10^3 (2.3 \times 10^3)$	0.20×10^5

---

(1) Includes solids and, oils and greases.

(): Numbers in parentheses represent the amount of scale that is recoverable out of the total amount of solid wastes generated.


BPT/PSES-1/BCT
Raw Wastewater
PRIMARY SCALE PIT
Oil
Recycle
Backwash
ROUGHING CLARIFIER
FILTER
VACUUM FILTER
Solids
BAT-1/PSES-2
Recycle
COOLING TOWER
BAT-2/PSES-3
Recycle
COOLING TOWER
EVAPORATION
100% Recycle to Process
Centrifuge

HOT FORMING FLOW RATES

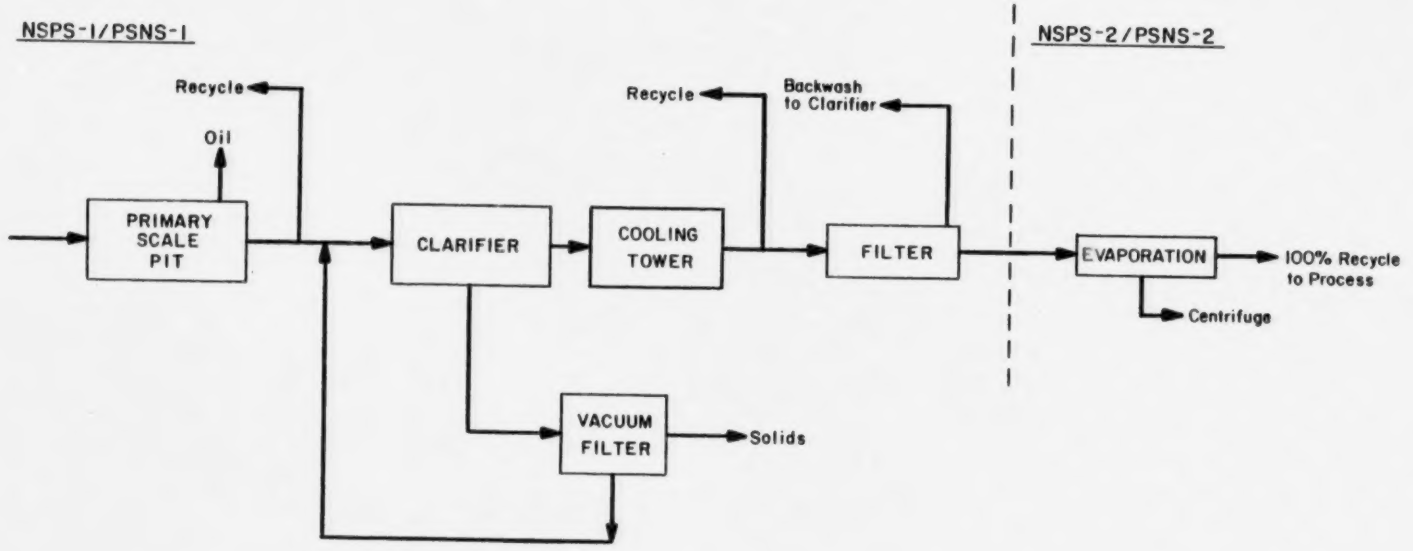
SUBDIVISION		APPLIED FLOW (GPT)	PSP RECYCLE (%)	BPT DISCHARGE FLOW (GPT)	BAT RECYCLE (%)(1)	BAT DISCHARGE FLOW (GPT)
PRIMARY	w/o Scarfer	2300	61	897	35	90
	w/Scarfer	3400	61	1326	35	140
SECTION	Carbon	5100	58	2142	38	200
	Specialty	3200	58	1344	38	130
FLAT	Hot Strip	6400	60	2560	36	260
	Carbon Plate	3400	60	1360	36	140
	Specialty Plate	1500	60	600	36	60
PIPE & TUBE		5520	77	1270	19	220

(1) Recycle increase over PSP recycle. Total overall BPT/BAT system recycle equals 96%.

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT FORMING
TREATMENT MODEL SUMMARY

Dwn. 3/2/82

FIGURE VIII-1


NSPS-1/PSNS-1
NSPS-2/PSNS-2
Recycle
Oil
PRIMARY SCALE PIT
CLARIFIER
COOLING TOWER
Recycle
Backwash to Clarifier
FILTER
EVAPORATION
100% Recycle to Process
Centrifuge
VACUUM FILTER
Solids

		NSPS FLOW RATES		
SUBDIVISION		APPLIED FLOW(GPT)	COMBINED RECYCLE RATE(%)	DISCHARGE FLOW (GPT)
PRIMARY	^{wo}/scarfer	2300	96	90
	^{w}/scarfer	3400	96	140
SECTION	Carbon	5100	96	200
	Specialty	3200	96	130
FLAT	Hot Strip	6400	96	260
	Carbon Plate	3400	96	140
	Specialty Plate	1500	96	60
PIPE & TUBE		5520	96	220

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING
NSPS/PSNS TREATMENT MODEL SUMMARY

Dwn. 3/1/82

FIGURE VIII-2

HOT FORMING SUBCATEGORY

SECTION IX

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF THE BEST PRACTICABLE CONTROL TECHNOLOGY CURRENTLY AVAILABLE

The Agency has promulgated best practical control technology currently available (BPT) limitations that are different than those originally promulgated in March, 1976 and proposed on January 7, 1981. These limitations are based upon the same model treatment system used to develop the prior limitations and upon an expanded industry data base acquired as part of this rulemaking. The 1976 limitations (and the proposed limitations) were based upon limited data for hot forming operations available at that time. The expanded data base includes nearly all hot forming operations and more accurately reflects the industry in terms of applied process water flows, and the installation and performance of wastewater treatment facilities. Some of the BPT limitations are more stringent than the proposed limitations and some are less stringent.

The subdivision of the Hot Forming subcategory is as follows:

Hot Forming - Primary
    Carbon and Specialty Mills Without Scarfers
    Carbon and Specialty Mills With Scarfers

Hot Forming - Section
    Carbon Mills
    Specialty Mills

Hot Forming - Flat
    Hot Strip and Sheet Mills
    Plate Carbon Steel Mills
    Plate Specialty Steel Mills

Hot Forming Pipe and Tube

Identification of BPT

The original BPT model treatment systems for primary, section, and flat operations included primary scale pits equipped with oil skimming facilities, partial recycle, roughing clarifiers, vacuum filters, and filters. In these models, recycle followed sedimentation of the process wastewaters in primary scale pits with the high blowdown from the partial recycle loop undergoing additional treatment. The BPT model treatment system for integrated hot working pipe and tube operations is similar to the system described above, however; recycle in this system follows sedimentation in a roughing clarifier instead

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of after the scale pit. Filtration was provided for the recycle blowdown. The model treatment system for isolated pipe and tube operations incorporated a primary scale pit equipped with oil skimming facilities, settling basin, and recycle. Partial recycle followed sedimentation in the settling basin, with the blowdown of the recycle loop receiving no further treatment. Makeup water is required to compensate for system losses in each of the cases presented above.

In the model treatment system the wastewater discharged from the mill is collected in a scale pit where large particles settle out and surface skimmers remove floating oils. Depending upon the hot forming subdivision, anywhere from 58 to 77 percent of the primary scale pit effluent is recirculated to the mill. The remaining wastewater effluent is processed in a roughing clarifier and then a filter for additional suspended solids and oil removal. A vacuum filter is used to dewater the under flow from the clarifier.

Figure IX-1 depicts the model treatment systems discussed above. Table IX-1 presents a summary of the characteristics of untreated hot forming process wastewaters. Sampled plant monitoring data were used to determine the raw wastewater pH values; however, the raw wastewater suspended solids and oil and grease concentrations were determined from information supplied in the D-DCPs (refer to Section VII). Sampled plant monitoring data could not be used for this purpose because, in most instances only samples of the effluents of primary scale pits could be obtained. The Agency believes its estimates of raw waste loadings are accurate.

As noted in Section VII, the components of the BPT model treatment systems are in use at most hot forming operations. Thus, the use of each treatment system component is substantiated.

Development of the BPT Effluent Limitations

a. Model Treatment System Flow Rates

Tables IX-2 through IX-9 present the applied process water flow (mgd and gal/ton) and production capacity for each hot forming operation for which the Agency has such data. These data were grouped by subdivision and the average applied flow was determined by dividing the total applied flow for all plants within the subdivision by the total production capacity of the subdivision. Production weighted average applied flow rates were developed for each segment for the purpose of establishing the model flow rates, which are, in turn, used for sizing and costing the model treatment systems and for establishing effluent limitations. The Agency believes that the weighted average method of determining the model flow rates results in the most representative flows for this subcategory. The data indicate wide variations in production and flow rates between the hot forming mills in each of the segments. The Agency could not identify subsets of hot forming mills which would be representative of the best plants in each segment, since no discernable patterns were evident in the data. Thus, the Agency decided to use all of the reported production and flow data to develop the model flow rates. The production weighted method for calculating the average minimizes the bias of the extremes in production and flow rates and results in a representative average model flow for each segment. The applied flows determined in this manner are presented below:

Subdivision	Applied Process Water Flow (Gallons/Ton)
Primary	
wo/scarfer	2300
w/scarfer	3400
Section	
carbon	5100
specialty	3200
Flat	
hot strip	6400
plate carbon	3400
specialty	1500
Pipe and Tube	5520

The Agency has determined that these flow rates are more representative of the flow rates achievable by operations in this subcategory than those used to develop the 1976 effluent limitations and the proposed limitations.

Primary scale pit recycle serves to minimize the flow requiring further treatment and thus the cost of such treatment. Table IX-10 presents primary scale pit recycle rate data for plants with primary scale pit recycle systems for which reported flow data recycle rates range from less than 10 percent of the applied flow to several reported values of 100 percent. The Agency believes that recycle rates in the range of 40 to 80 percent are representative of good wastewater management practices for primary, section, and flat operations. The average of values in this range for each of these operations is about 60 percent. This degree of recycle provides for significant cost reduction in downstream treatment facilities and, as demonstrated at many plants, can be achieved without cooling of the return water. For pipe and tube operations, the Agency determined that higher primary scale pit recycle rates are typical of these mills with primary scale pit recycle and a rate of 77 percent was selected as the model plant recycle rate. The Agency does not believe that scale pit recycle rates greater than 80% for these operations can be achieved at all plants. Based upon the applied flows presented above and these primary scale pit recycle rates, the following model plant BPT effluent flows were developed:

Subdivision	BPT Model Plant Effluent Flow (Gallons/Ton)
Primary	
wo/scarfer	897
w/scarfer	1326
Section	
carbon	2142
specialty	1344
Flat	
hot strip	2560
plate - carbon	1360
- specialty	600
Pipe and Tube	1270

b. Model Treatment System Effluent Quality

The final treatment component in the BPT model treatment system is filtration of the discharge flow. The Agency determined that the following concentrations of total suspended solids and oil and grease represent consistently achievable effluent quality for filtration systems:

	30 Day Average	Daily Maximum
Total Suspended Solids	15 mg/l	40 mg/l
Oil and Grease	-	10 mg/l

These performance values were determined from long term filtration data (nearly 6000 points) for several hot forming and other steel industry operations with similar wastewaters as shown in Tables IX-11 and IX-12. Refer to Tables A-9 through A-13 of Appendix A to Volume I for the development of these concentration values. Only a daily maximum oil and grease limitation was selected to avoid possible problems with sampling and analytical detection and accuracy at concentrations of less than 5 mg/l.

c. BPT Effluent Limitations

The resulting BPT effluent limitations are presented in Table IX-13. Those limitations were determined with the effluent flow and concentration data presented above.

Demonstration of BPT Effluent Limitations

Based upon a review and update of all forming operations for which it has data the Agency has determined that about 75 percent of the hot forming operations are currently in compliance with the BPT effluent limitations. Treatment systems installed at these facilities range from less than the model treatment systems with to extensive high rate recycle systems with small blowdowns. Tables IX-14 to IX-21, present data for some of the plants in compliance with the limitations. Those listed plants that do not meet the limitations have flows that greatly exceed the limitations, or lack one of the treatment components, e.g., oil skimmers. The Agency believes these plants will comply with the limitations if the flows are reduced or the missing treatment components are installed. Table IX-22 presents data for treatment plants that demonstrate compliance with the hot forming limitations.

TABLE IX-1

RAW WASTEWATER CHARACTERISTICS
HOT FORMING SUBCATEGORY

OPERATIONS		SUSPENDED SOLIDS (mg/L)	OIL AND GREASE (mg/L)	pH (UNITS)
HOT FORMING (PRIMARY)	(1) Carbon and Specialty Steel Operation w/o Scarfing	2,200	35	6-9
	(2) Carbon and Specialty Steel with Scarfing	3,000	56	6-9
HOT FORMING (SECTION)	(1) Carbon Steel Operations	990	38	6-9
	(2) Specialty Steel Operations	1,600	60	6-9
HOT FORMING (FLAT)	(1) Hot Strip and Sheet Operations	790	30	6-9
	(2) Carbon Steel Plate Operations	1,500	56	6-9
	(3) Specialty Steel Plate Operations	3,400	130	6-9
HOT FORMING (PIPE AND TUBE)	(1) Carbon and Specialty Steel Operations	910	35	6-9

TABLE IX-2

APPLIED FLOW DETERMINATION
HOT FORMING-PRIMARY: CARBON & SPECIALTY

Basic Flow, Excluding Machine Scarfing

Plant Reference Code	Applied Flow (Gal/Ton)	Production Capacity (Tons/Day)	Total Applied Flow (MGD)
0020B	1594	4065	6.48
0060	1012	8537	8.64
0060D	254	2268	0.58
0060G	3891	2868	11.16
0060I	3782	495	1.87
0176	760	285	0.22
0188A	5585	825	4.61
0188B	3656	804	2.94
0248C	2186	415	0.91
0320-02	805	9600	7.73
0384A-01	7483	3864	28.91
0396E	4465	1419	6.34
0424	800	450	0.36
0430C-01	288	90	0.026
0430C-02	1655	114	0.19
0440A	27,163	387	10.51
0476A	3273	1699	5.56
0492A	1551	3714	5.76
0528A	1090	5550	6.05
0612-01	3913	3312	12.96
0612-02	4926	2631	12.96
0640	4332	1878	8.14
0652A	1087	795	0.86
0672B	6517	453	2.95
0684A	742	4851	3.60
0684B	1050	4905	5.15
0684E	857	2520	2.16
0684F-01	3698	1752	6.48
0856H-01	2725	1872	5.10
0856H-02	2787	1830	5.10
0856T-01	1281	4059	5.20
0860B-04	3587	2529	9.07
0860H-01	6747	2988	20.16
0860H-02	1866	8490	15.84
0860H-03	320	3441	1.10
0864A-01	1272	6795	8.64
0864A-02	2124	2373	5.04
0864C	1280	450	0.58
0868A-01	1236	3000	3.71

TABLE IX-2
APPLIED FLOW DETERMINATION
HOT FORMING-PRIMARY: CARBON & SPECIALTY
PAGE 2

Plant Reference Code	Applied Flow (Gal/Ton)	Production Capacity (Tons/Day)	Total Applied Flow (MGD)
0868A-02	614	2340	1.44
0868A-03	1886	4692	8.85
0920A	3100	5361	16.62
0920B	2382	5325	12.68
0940	1067	135	0.14
0946A	1296	3066	3.97
0948A	1105	3909	4.32
0948B	1095	3930	7.49
0948C-01	710	4461	3.17
0948C-02	3308	7923	26.21

$$\text{Production Weighted Applied Flow Average}^{*} = \frac{\Sigma\ \text{Total Applied Flow (MGD)}^{**}}{\Sigma\ \text{Production Capacity (TPD)}^{**}} = \frac{355{,}101{,}000\ \text{GPD}}{162{,}242\ \text{TPD}}$$

$$= 2276\ \text{Gal/Ton}$$

Use: 2300 Gal/Ton

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* : Based upon available data. Data for those operations with unknown flows or with flows which included scarfing or noncontact cooling water are not included.

**: These totals include flow and production data for confidential plants.

TABLE IX-3

APPLIED FLOW DETERMINATION
HOT FORMING-PRIMARY: CARBON & SPECIALTY
MACHINE SCARFING OPERATIONS

Plant Reference Code	Applied Flow (Gal/Ton)	Production Capacity (Tons/Day)	Total Applied Flow (MGD)
0060	1012	8537	8.64
0060G	1004	2868	2.88
0320-02	1370	9600	13.15
0528A	1038	5550	5.76
0684F-01	2466	1752	4.32
0920A	365	5361	1.96
0946A	254	3066	0.78
0948H	2376	3909	9.29
0948C-02	600	7923	4.75

$$\text{Production Weighted Applied Flow Average*} = \frac{\Sigma\ \text{Total Applied Flow (MGD)}}{\Sigma\ \text{Production Capacity (TPD)}} = \frac{56{,}300{,}000\ \text{Gal/Day}}{54{,}131\ \text{Ton/Day}}$$

$$= 1040\ \text{Gal/Ton}$$

Use: 1050 Gal/Ton**

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* : Based upon available data. Data for those operations with unspecified or nonsegregated scarfer flow data are not included.

**: An additional applied flow of 50 gal/ton is provided to account for blowdowns from scarfer fume scrubbers. Total applied flow from scarfing operations is 1100 gal/ton.

TABLE IX-4

APPLIED FLOW DETERMINATION
HOT FORMING-SECTION: CARBON MILLS

Plant Reference Code	Applied Flow (gal/ton)	Production Capacity (tons/day)	Total Applied Flow (MGD)
0060F-05	11,576	1,224	14.17
0060G-01	2,342	2,337	5.47
0060G-02	3,429	1,008	3.46
0060G-03	12,490	294	3.67
0060G-04	6,515	1,326	8.63
0060H-01	3,025	1,071	3.24
0060K-01	8,045	537	4.32
0068B	20,386	353	7.20
0112A-01	4,627	3,735	17.28
0136B-01	8,372	522	4.37
0136B-02	22,942	354	8.12
0136C	11,859	411	4.87
0188B	7,258	804	5.84
0188C	7,480	462	3.46
0288A-05	1,995	21	0.042
0288A-06	7,014	4	0.028
0288A-07	316	334	0.11
0288A-08	1,328	37	0.049
0316	9,044	446	4.03
0316A	7,543	420	3.17
0316B	10,383	423	4.39
0384A-02	3,055	3,420	10.45
0384A-03	3,797	1,479	5.62
0384A-04	3,860	933	3.60
0384A-05	8,029	816	6.55
0384A-06	3,376	1,758	5.94
0432A-02	6,340	1,167	7.39
0460A-01	4,816	897	4.32
0460A-02	7,744	702	5.44
0460B	32,686	441	14.41
0468B	7,811	1,294	10.10
0468F	29,465	312	9.19
0476A-01	16,719	190	3.18
0476A-02	9,018	502	4.53
0476A-03	10,075	800	8.06
0584F	14,900	807	12.02

TABLE IX-4
APPLIED FLOW DETERMINATION
HOT FORMING-SECTION: CARBON MILLS
PAGE 2

Plant Reference Code	Applied Flow (gal/ton)	Production Capacity (tons/day)	Total Applied Flow (MGD)
0612-01	4,204	3,162	13.29
0612-02	9,870	1,386	13.68
0612-03	12,527	1,092	13.68
0612-04	4,204	948	3.99
0612-05	5,462	1,239	6.77
0640	3,352	903	3.03
0640A-01	11,449	203	2.32
0640A-02	13,775	507	6.98
0652A-01	7,111	243	1.73
0652A-02	6,261	345	2.16
0672A-01	5,418	817	4.43
0672A-02	10,967	328	3.60
0684A-01	1,705	2,112	3.60
0684A-02	10,052	573	5.76
0684F-01	3,767	1,338	5.04
0684F-02	8,282	765	6.34
0684F-03	8,190	756	6.19
0684G-01	2,240	900	2.02
0684G-02	4,774	1,131	5.40
0684G-03	5,026	573	2.88
0684G-04	9,722	237	2.30
0684H-01	4,710	2,898	13.65
0684H-03	910	2,898	2.64
0684H-04	3,792	1,314	4.98
0684H-05	3,507	1,707	5.99
0684H-06,07	3,400	1,428	4.86
0804B-01	138	150	0.021
0804B-02	131	342	0.045
0856F-01	1,258	6,867	8.64
0856F-02	952	6,867	6.54
0856F-04	12,238	1,057	12.94
0856F-05	8,101	2,133	17.28
0856H-01	1,515	1,683	2.55
0856H-02	1,906	1,338	2.55
0856K-01	61	123	0.0075
0856K-02	198	255	0.050
0856K-03	1,770	732	1.30

TABLE IX-4
APPLIED FLOW DETERMINATION
HOT FORMING-SECTION: CARBON MILLS
PAGE 3

Plant Reference Code	Applied Flow (gal/ton)	Production Capacity (tons/day)	Total Applied Flow (MGD)
0856N-01	3,226	3,348	10.80
0856N-02	6,272	1,722	10.80
0856P	5,656	1,233	6.97
0856T-01	535	1,029	0.55
0856U-01	14,894	204	3.04
0856U-02	6,699	690	4.62
0856U-03	5,638	378	2.13
0856U-04	12,288	225	2.76
0856U-05	8,125	693	5.63
0860B-01	3,309	2,132	7.05
0860B-02	5,909	536	3.17
0860B-03	6,522	486	3.17
0860B-04	2,663	1,135	3.02
0860B-05	9,399	429	4.03
0860B-08	11,993	492	5.90
0860B-09	7,590	474	3.60
0860B-10	12,751	892	11.37
0860B-11	6,880	1,464	10.07
0860F-01	7,934	726	5.76
0860F-02	4,936	1,167	5.76
0860H-01	7,796	2,616	20.39
0860H-02	4,720	1,380	6.51
0860H-03	6,930	2,058	14.26
0864A	10,729	2,040	21.89
0864B	9,054	1,161	10.51
0864C-01	3,840	450	1.73
0864C-02	10,000	360	3.60
0868A-01	1,020	1,902	1.94
0868A-02	709	2,307	1.64
0868A-03	1,647	1,386	2.28
0868A-04	3,909	249	0.97
0868A-05	963	537	0.52
0920B-01	1,037	1,806	1.87
0920B-02	1,674	516	0.86

TABLE IX-4
APPLIED FLOW DETERMINATION
HOT FORMING-SECTION: CARBON MILLS
PAGE 4

Plant Reference Code	Applied Flow (gal/ton)	Production Capacity (tons/day)	Total Applied Flow (MGD)
0946A-01	7,589	759	5.76
0946A-03	7,798	831	6.48
0948B	2,625	768	2.02
0948F-03	3,750	29	0.11

$$\text{Production Weighted Applied Flow Average}^{*} = \frac{\Sigma\ \text{Total Applied Flow}^{**}}{\Sigma\ \text{Production Capacity}^{**}} = \frac{661{,}980{,}000\ \text{gal/day}}{130{,}892\ \text{tons/day}}$$

$$= 5058\ \text{gal/ton}$$

Use: 5100 gal/ton

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* : Based upon available data. Data from those operations with unknown or unavailable flows are not included.

**: This total includes flow and production data for confidential operations.

TABLE IX-5

APPLIED FLOW DETERMINATION
HOT FORMING SECTION-SPECIALTY MILLS

Plant Reference Code	Applied Flow (gal/ton)	Production Capacity (tons/day)	Total Applied Flow (MGD)
0060I-01	10,636	176	1.87
0060I-02	13,040	138	1.80
0088A	561	531	0.30
0088D	6,430	885	5.69
0112-07	33,391	138	4.61
0176-01,02,03	3,570	119	0.42
0176-04	8,228	210	1.73
0240A-01,02	2,600	1,422	3.70
0288A-01	4,114	7	0.029
0288A-02	2,527	14	0.035
0288A-03	2,359	22	0.052
0288A-04	3,136	11	0.034
0384A-01	3,055	2,418	7.39
0384A-07	3,276	879	2.88
0424-01	7,283	44	0.32
0424-02	11,707	25	0.29
0424-03	10,537	25	0.26
0440A	3,200	45	0.14
0672B-01	4,880	270	1.32
0672B-02	5,922	462	2.74
0684D-01	1,493	1,929	2.88
0684D-02	1,689	1,626	2.75
0684E-01	3,087	1,185	3.66
0684E-02	8,571	504	4.32
0684H-02	580	2,280	1.32
0776H-01	2,347	37	0.087
0946A-02	8,742	906	7.92

$$\text{Production Weighted Applied Flow Average*} = \frac{\Sigma\ \text{Total Applied Flow**}}{\Sigma\ \text{Production Capacity}} = \frac{64{,}910{,}000\ \text{gal/day}}{20{,}563\ \text{tons/day}} = \frac{3157\ \text{gal/ton}}{\text{use 3200 gal/ton}}$$

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* : Based upon available data. Data for those operations with unknown or unavailable flows are not included.

**: This total includes flow and production data for confidential operations.

TABLE IX-6

APPLIED FLOW JUSTIFICATION
HOT FORMING-FLAT: HOT STRIP AND SHEET

Plant Reference Code	Applied Flow (gal/ton)	Production Capacity (tons/day)	Total Applied Flow (MGD)
0020B	5,690	2,550	14.5
0060	8,297	10,032	83.24
0060D	7,143	2,520	18.00
0112A(03)	4,911	6,978	34.27
0112A(04)	5,619	7,893	44.35
0112D	5,790	12,744	73.79
0176	9,630	240	2.31
0248B	7,680	1,500	11.52
0320(02)	9,951	8,232	81.92
0384A(02)	10,193	12,291	125.28
0384A(03)	17,511	3,666	64.20
0384A(04)	8,573	5,400	46.29
0396D(01)	24,935	231	5.76
0396D(02)	7,033	1,638	11.52
0424(02)	716	20.1	0.01
0432A	4,800	5,400	25.92
0432C	3,500	10,404	36.41
0476A	6,282	828	5.20
0492A	3,471	3,152	10.94
0528A	4,686	5,549	26.00
0584B	4,150	14,022	58.19
0584C	3,680	9,375	34.50
0584F	3,160	8,322	26.30
0684B	6,660	6,396	42.60
0684F(02)	9,347	8,223	76.86
0684I(01)	5,802	3,429	19.90
0684V(02)	8,803	20.7	0.18
0776H(02)	6,400	18	0.12
0856D	4,450	8,445	37.58
0856F(01)	5,497	9,168	50.40
0856F(02)	2,840	3,042	8.64
0856P	5,125	253	1.30
0856U(01)	11,277	558	6.29

TABLE IX-6
APPLIED FLOW JUSTIFICATION
HOT FORMING-FLAT: HOT STRIP AND SHEET
PAGE 2

Plant Reference Code	Applied Flow (gal/ton)	Production Capacity (tons/day)	Total Applied Flow (MGD)
0856U(02)	22,944	150	3.44
0856U(03)	6,400	639	4.09
0856U(04)	4,847	915	4.44
0856U(05)	11,809	2,907	34.33
0860B(01)	8,448	12,204	103.10
0860B(02)	5,594	5,895	32.98
0864A	4,666	6,018	28.08
0868A(02)	21,356	177	3.78
0868A(03)	2,905	4,854	14.10
0920C	7,767	3,300	25.63
0920N	8,200	7,992	65.53
0948A	6,076	7,584	46.08
0948C	6,602	8,724	57.60

$$\text{Production Weighted Applied Flow Average*} = \frac{\text{TOTAL APPLIED FLOW**}}{\text{TOTAL PRODUCTION CAPACITY**}}$$

$$= \frac{1{,}506{,}470{,}000 \text{ gal/day}}{233{,}899 \text{ tons/day}} = 6440 \text{ gal/ton}$$

Say 6,400 gal/ton

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* : Based upon available data. Data for those operations with unknown or unavailable flows are not included.

**: These totals do not include confidential data from one plant.

TABLE IX-7

APPLIED FLOW JUSTIFICATION
HOT FORMING-FLAT: PLATE (CARBON)

Plant Reference Code	Applied Flow (gal/ton)	Production Capacity (tons/day)	Total Applied Flow (MGD)
0060F(01)	3,976	2,115	8.41
0112A(01)	2,455	1,056	2.59
0112A(02)	2,778	2,592	7.20
0112D(01)	3,240	3,360	10.89
0384A(01)	7,867	972	7.65
0496(140")	120	1,830	0.22
0496(140"/206")	206	6,300	1.30
0496(112"/120')	870	1,740	1.51
0684I(02)	7,558	1,629	12.31
0856H(01)	117	984	0.12
0856H(02)	5,473	3,939	21.56
0856H(03)	3,652	2,916	10.65
0860B(03)	2,550	3,162	8.06
0860H(01)	9,790	648	6.34
0860H(02)	5,489	2,886	15.84
0868A(01)	3,922	1,800	7.06
0868B	4,992	3,894	19.44

$$\text{Production Weighted Applied Flow Average*} = \frac{\text{TOTAL APPLIED FLOW}}{\text{TOTAL PRODUCTION CAPACITY}}$$

$$= \frac{141{,}100{,}000 \text{ gal/day}}{41{,}823} = 3374 \text{ gal/ton}$$

Say - 3400 gal/ton

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*: Based upon available data. Data for those operations with unknown or unavailable flows are not included.

TABLE IX-8

APPLIED FLOW JUSTIFICATION
HOT FORMING-FLAT: PLATE (SPECIALTY)

Plant Reference Code	Applied Flow (gal/ton)	Production Capacity (tons/day)	Total Applied Flow (MGD)
0424(01)	800	450	0.36
0496(140")	144	1,830	0.26
0496(112"/120")	2,653	1,740	4.62
0684V(01)	8,803	119.4	1.05
0776H(01)	960	60	0.06

$$\text{Production Weighted Applied Flow Average} = \frac{\text{TOTAL APPLIED FLOW*}}{\text{TOTAL PRODUCTION CAPACITY*}}$$

$$= \frac{6{,}350{,}000 \text{ gal/day}}{4199.4 \text{ tons/day}} = 1512 \text{ gal/ton}$$

Say - 1500 gal/ton

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*: These totals do not include the confidential data from one plant.

TABLE IX-9

APPLIED FLOW JUSTIFICATION
HOT WORKING PIPE AND TUBE

Plant Reference Code	Applied Flow (gal/ton)	Production Capacity (tons/day)	Total Applied Flow (MGD)
0088A-03	2,712	171	0.46
0088C-01	3,552	283.8	1.01
0088C-02	6,436	268.5	1.73
0196A	12,794	822	10.52
0240B-05	1,858	213	0.40
0256G	515	564	0.29
0396E	450	480	0.22
0432A-01	8,080	699	5.65
0476A	4,672	381.6	1.78
0492A-05	10,154	156	1.58
0548	4,573	196.8	0.90
0548A-01	8,000	126	1.01
0548A-02	6,857	42	0.29
0652A	3,672	363	1.33
0684A-02	4,311	1,002	4.32
0684H	7,010	540	3.79
0728	2,560	240	0.61
0856C	1,667	36	0.06
0856F-01	7,111	663	11.52
0856F-02		957	
0856N-01	3,418	1,011	3.46
0856N-02	3,648	1,500	5.47
0856N-03	3,083	981	3.02
0856N-04	3,730	888	3.31
0916A-01	2,765	600	1.66
0920C-01	4,706	229.5	1.08
0920C-02	5,788	373.2	2.16
0948A-01	6,207	615	8.64
0948A-02		777	
0948A-03	3,077	468	1.44
0948C-01	21,405	444	9.50
0948C-02	6,611	501	3.31

$$\text{Production Weighted Applied Flow Average*} = \frac{\text{TOTAL APPLIED FLOW**}}{\text{TOTAL PRODUCTION CAPACITY**}}$$

$$= \frac{99{,}290{,}000 \text{ gal/day}}{17{,}985 \text{ tons/day}} = 5521 \text{ gal/ton}$$

Say 5,520 gal/ton

---

* : Based upon available data. Those operations with unknown or unavailable flows are not included.

**: These totals include confidential data.

TABLE IX-10

ANALYSIS OF RECYCLE RATES
FROM PRIMARY SCALE PITS
HOT FORMING SUBCATEGORY

Subdivision	Plant Code	Recycle Percentage
A. Primary	0946A	9.0*
	0684G	14.7*
	0856F	25.0*
	0432C	44.9
	0856N	47.0
	0868A-03	48.8
	0060-01	50.0
	0112A-01	53.0
	0948A	63.5
	0920B	68.0
	0640	70.8
	0112A-03	75.0
	0864A-01	75.0
	0724A	79.2
	0864A-02	85.7*
	0060G-01	86.0*
	0320-02	96.2*
	0940	100.0*
	Average of Unstarred Values =	61.4%
B. Section	0060G-01	6.3*
	0684G-01	8.8*
	0060H-01	32.0*
	0384A-06	33.0*
	0684H-05	42.0
	0684H-04	44.4
	0856F-03	50.0
	0856F-02	50.0
	0060F-04	56.5
	0856F-02	66.7
	0060I-02	75.0
	0864A	78.9
	0476A-03	97.2*
	0864B	97.3*
	0460B	99.0*
	0068B	100.0*
	0256N-01	100.0*
	0256N-02	100.0*
	0256N-03	100.0*
	0316A	100.0*
	Average of Unstarred Values =	57.9%(1)

TABLE IX-10
ANALYSIS OF RECYCLE RATES FROM PRIMARY SCALE PITS HOT FORMING SUBCATEGORY
PAGE 2

Subdivision	Plant Code	Recycle Percentage
C. Flat	0060	4.3
	0860B-01	14.0
	0684F-02	19.5
	0856F	22.9
	0384A-02	27.6
	0320-02	32.3
	0920C	33.7
	0920N	40.8*
	0856F-02	66.7*
	0112A-03	71.2*
	0496(140")	87.5
	0112A-04	89.6
	Average of Starred Values =	59.6%
D. Pipe & Tube	0856F(01 & 02)	50.0
	0476A	78.7
	0548	80.0
	0856C	99.4
	Average of Unstarred Values =	77.0%

---

(1) Average includes some confidential values

TABLE IX-11

LONG-TERM DATA ANALYSIS
FILTRATION SYSTEMS
TOTAL SUSPENDED SOLIDS

Plant	Number of Sample Points	Average (mg/l)	Variability Factors	
			Average	Maximum*
0112C-334	415	2.3	1.4	6.8
0112I-5A	59	3.6	1.5	8.9
0112C-617	399	4.8	1.3	5.4
0684H-EF	40	6.0	1.3	5.3
0112C-011	580	8.9	1.3	3.5
0112B-5A	87	10.6	1.1	2.3
0384A-4L	289	10.8	1.3	3.0
0112C-122	496	13.3	1.3	4.0
0384A-3E	305	17.4	1.2	2.5
0684F-4I	78	22.2	1.2	3.7
Median Values		9.8	1.3	3.9

30-Day Average Concentration Basis = (9.8 mg/l) (1.3) = 12.7 mg/l

Daily Maximum Concentration Basis = (9.8 mg/l) (3.9) = 38.2 mg/l

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Note: For the purposes of developing effluent limitations and standards, the following values were used for total suspended solids.

Average = 15 mg/l
Maximum = 40 mg/l

* For plants with more than 100 observations:

$$\text{Daily Variability Factor} = \frac{\text{99th Percentile}}{\text{Average}}$$

TABLE IX-12

LONG-TERM DATA ANALYSIS
FILTRATION SYSTEMS
OIL AND GREASE

Plant	Number of Sample Points	Average (mg/l)	Variability Factors Average	Variability Factors Maximum*
0112B-5A	87	1.1	1.1	2.9
0112C-334	727	1.3	1.4	5.3
0112C-617	647	1.3	1.4	4.5
0112C-122	684	2.0	1.3	5.3
0684H-EF	27	3.4	1.4	3.8
0112C-011	690	6.7	1.3	5.1
0384A-4L	290	6.7	1.2	3.4
Median Values		2.0	1.3	4.5

30-Day Average Concentration Basis = (2.0 mg/l) (1.3) = 2.6 mg/l

Daily Maximum Concentration Basis = (2.0 mg/l) (4.5) = 9.0 mg/l

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Note: A maximum value of 10 mg/l has been used to develop effluent limitations and standards for oil and grease.

* For plants with more than 100 observations:

$$\text{Daily Variability Factor} = \frac{\text{99th Percentile}}{\text{Average}}$$

TABLE IX-13

BPT EFFLUENT LIMITATIONS
HOT FORMING SUBCATEGORY

		Concentration (mg/l) All Hot Forming	Primary Mills		Section Mills		Flat			Pipe & Tube & Mills
			Without Scarfers	With Scarfers	Carbon	Specialty	Hot Strip & Sheet	Carbon Plate	Specialty Plate	Carbon & Specialty
Discharge Flow (gal/ton)		-	897	1,326	2,142	1,344	2,560	1,360	600	1,270
Total Suspended Solids	Avg.	15	0.0561	0.0830	0.134	0.0841	0.160	0.0851	0.0375	0.0795
	Max.	40	0.150	0.221	0.357	0.224	0.407	0.227	0.100	0.212
Oil & Grease	Avg.	-	-	-	-	-	-	-	-	-
	Max.	10	0.0374	0.0553	0.0894	0.0561	0.107	0.0567	0.0250	0.0530

Note: pH is also regulated at BPT and is limited to 6.0 to 9.0 standard units for all hot forming operations.

TABLE IX-14

JUSTIFICATION OF BPT EFFLUENT LIMITATIONS
HOT FORMING - PRIMARY : W/SCARFING

		Discharge flow (Gal/Ton)	Suspended Solids	Oil and Grease	pH	C&TT Components
	BPT	1326	0.0830	0.0553	6 - 9	PSP,SS,RUP,CL,VF,FP,RTP
Plant Visits						
B-2	0112B(03)	510	0.0064	0.0047	7.7 - 7.8	PSP,CL,FP,OT
082	0496					
140"		170	0.00071	0.0085	7.4 - 7.5	PSP,SSP,CL,FG,OT
140"/206"		460	0.0019	0.017	7.4	PSP,SSP,CL,FG,OT
088	0684H	5	0.000038	0.00018	7.6 - 7.8	PSP,FP,RTP 99.7
288A	0584F	818	0.0089	NA	7.3 - 7.4	PSP,SSP,SS,FG,T,OT
291	0856B	35	0.0012	NA	7.3 - 7.4	PSP,CL,FP,CT,RTP 99
294A	0920N	290	0.0085	NA	7.1	PSP,SSP,FP,RTP 88

TABLE IX-15

JUSTIFICATION OF BPT EFFLUENT LIMITATIONS
HOT FORMING - PRIMARY : W/O SCARFING

		Discharge flow (Gal/Ton)	Suspended Solids	Oil and Grease	pH	C&TT Components
	BPT	897	0.0561	0.0374	6 - 9	PSP,SS,RUP,CL,VF,FP,RTP
Plant Visits						
E	0020B	2740	0.16	0.017	5.8 - 6.6	PSP,CL,FP,OT
081	176	51(1)	0.0038	0.0021	7.8 - 8.1	PSP,TP,RTP 93
083	0860H	12	0.00039	0.00076	7.1 - 7.6	PSP,CL,CT,RTP 96

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(1) These data represents the discharge from preliminary treatment prior to discharge to central treatment.

TABLE IX-16

JUSTIFICATION OF BPT EFFLUENT LIMITATIONS
HOT FORMING - SECTION: CARBON

		Discharge flow (Gal/Ton)	Suspended Solids	Oil and Grease	pH	C&TT Components
	BPT	2142	0.134	0.0894	6 - 9	PSP,SS,RUP,CL,VF,FP,RTP
Plant Visits						
E-2	0196A	1640	0.075	0.059	8.3	PSP,CL,FP,CT,SL,RTP 65
F-2	0384A	140	0.017	0.0048	7.8 - 8.5	PSP,SSP,SS,CL,FLL,FLP,NW VF,CT,RTP 98
G-2	0640A	0	0.0	0.0	7.4 - 8.1	PSP,SS,SL,FD,CT,RTP 100
083	0860H					
34" Mill		180	0.00082	0.015	7.1 - 7.6	PSP,CL,CT,T,RTP 96
Rod Mill		90	0.023	0.011	7.4	PSP,CL,RTP 99
290B	0856R	192	0.0062	NA	8.9 - 9.1	PSP,SS,FLP,CL,FP,RTP 79.7, RUP
088	0684H					
10"/11"		10.2	0.00081	0.00068	8.5 - 9.5	PSP,SSP,SB,CL,T,VF,FLP,RTP 99.7
36"		14	0.000090	0.00016	7.6 - 7.8	PSP,FD,CL,T,VF,RTP 99.7
32"		2.8	0.000025	0.00018	7.6 - 7.8	PSP,FD,CL,T,VF,RTP 99.7
14"		10	0.0036	0.00063	7.5	PSP,CT,CL,RUP 44,RTP 55.7

TABLE IX-17

JUSTIFICATION OF BPT EFFLUENT LIMITATIONS
HOT FORMING - SECTION: SPECIALTY

		Discharge flow (Gal/Ton)	Suspended Solids	Oil and Grease	pH	C&TT Components
	BPT	1344	0.0841	0.0561	6 - 9	PSP,SS,RUP,CL,VF,FP,RTP
Plant Visits						
081	0176	250	0.014	0.0024	7.8 - 8.1	SSP,SS,TP,CT,RTP 93
088	0684H					
34" Mill		1.7	0.000012	0.000033	7.6 - 7.8	PSP,FD,CL,T,VF,RTP 99.7
282B	0088D	48	0.017	NA	NA	PSP,SSP,SS,RUP 99.3
285B	0240A	298	0.016	NA	7.8 - 8.0	PSP,SSP,SS,SL,RTP 88.5

TABLE IX-18

JUSTIFICATION OF BPT EFFLUENT LIMITATIONS
HOT FORMING-FLAT (HOT STRIP AND SHEET)

		Discharge Flow (gal/ton)	Suspended Solids	Oil and Grease	pH	C&TT Components
BPT		2560	0.160	0.107	6-9	PSP,SS,RUP,CL,VF,FP,RTP
Plant Visits						
L-2	0060	76	0.0016	0.0025	8.6-8.7	PSP,FLL,FLM,CL,VF,CT,RTP-98.3
N-2	0396D	0	0	0	-	PSP,CT,VF,CL,F(UNK)S(UNK),RTP-100
086	0112D-02	5790	0.061	0.020	7.6-7.9	PSP,SS,CL,FLP,NL,NW,CR,SL(UNK)
281	0020B	5690	0.112	NA	7.3-7.5	PSP,CL,FP,OT
284A	0112D	2470	0.018	NA	NA	PSP,FLP,SL,RUP-46.2,RTP-13.4
288B	0584F	3150	0.036	NA	7.3-7.4	PSP,SSP,SS,FG,T,OT
289B	0684B	887	0.12	NA	7.5-7.8	PSP,SS,CT,SL,RUP-39,RTP-47.7

TABLE IX-19

JUSTIFICATION OF BPT EFFLUENT LIMITATIONS
HOT FORMING-FLAT: CARBON STEEL PLATE

		Discharge Flow (gal/ton)	Suspended Solids	Oil and Grease	pH	C&TT Components
BPT		1360	0.0851	0.0567	6-9	PSP,SS,RUP,CL,VF,FP,RTP
Plant Visits						
K-2	0868B	100	0.0022	0.0026	7.0-7.3	PSP,SSP,T,Filter,CT,RTP-97
082	0496					
	112"/120"	870	0.0064	0.064	7.4	PSP,SSP,DR,FG,OT
	140"	120	0.00088	0.0088	7.4	PSP,SSP,DR,FG,OT
	140"/206"	210	0.0021	0.018	7.4	PSP,SSP,DR,FG,OT
083	0860H	360	0.00011	0.0014	7.1-7.6	PSP,CL,CT,RTP-96.3
086	0112D	3240	0.026	0.021	7.6-7.9	PSP,CL,FLP,SL,OT

TABLE IX-20

JUSTIFICATION OF BPT EFFLUENT LIMITATIONS
HOT FORMING-FLAT: SPECIALTY STEEL PLATE

	Discharge Flow (gal/ton)	Suspended Solids	Oil and Grease	pH	C&TT Components
BPT	600	0.0375	0.0250	6-9	PSP,SS,RUP,CL,VF,FP,RTP
Plant Visits					
082 0496					
112"/120"	2650	0.018	0.23	7.5	PSP,SSP,DR,FG,OT
140"	870	0.0085	0.076	7.5	PSP,SSP,DR,FG,OT

TABLE IX-21

JUSTIFICATION OF BPT EFFLUENT LIMITATIONS
HOT WORKING PIPE AND TUBE

	Discharge Flow (gal/ton)	Suspended Solids	Oil and Grease	pH	C&TT Components
BPT	1270	0.0795	0.0530	6-9	PSP,SS,RUP,CL,VF,FP,RTP
Plant Visits					
E-2 0196A	4570	0.14	0.22	8.3	PSP,SS,SSP,SS,SL,CL, FP,CT,RTP-65
GG-2 0240B	0	0	0	-	PSP, Oil Separator, SL,RUP-100
II-2 0916A	2760	0.50	0.026	7.7	PSP,SS,FP,SL
JJ-2 0728	0	0	0	-	PSP,SL,RTP and RET-100
088 0684H	21	0.00021	0.00087	7.6-7.8	FP,VF,FLL,FLP,CT,CL,T,RTP-99.7

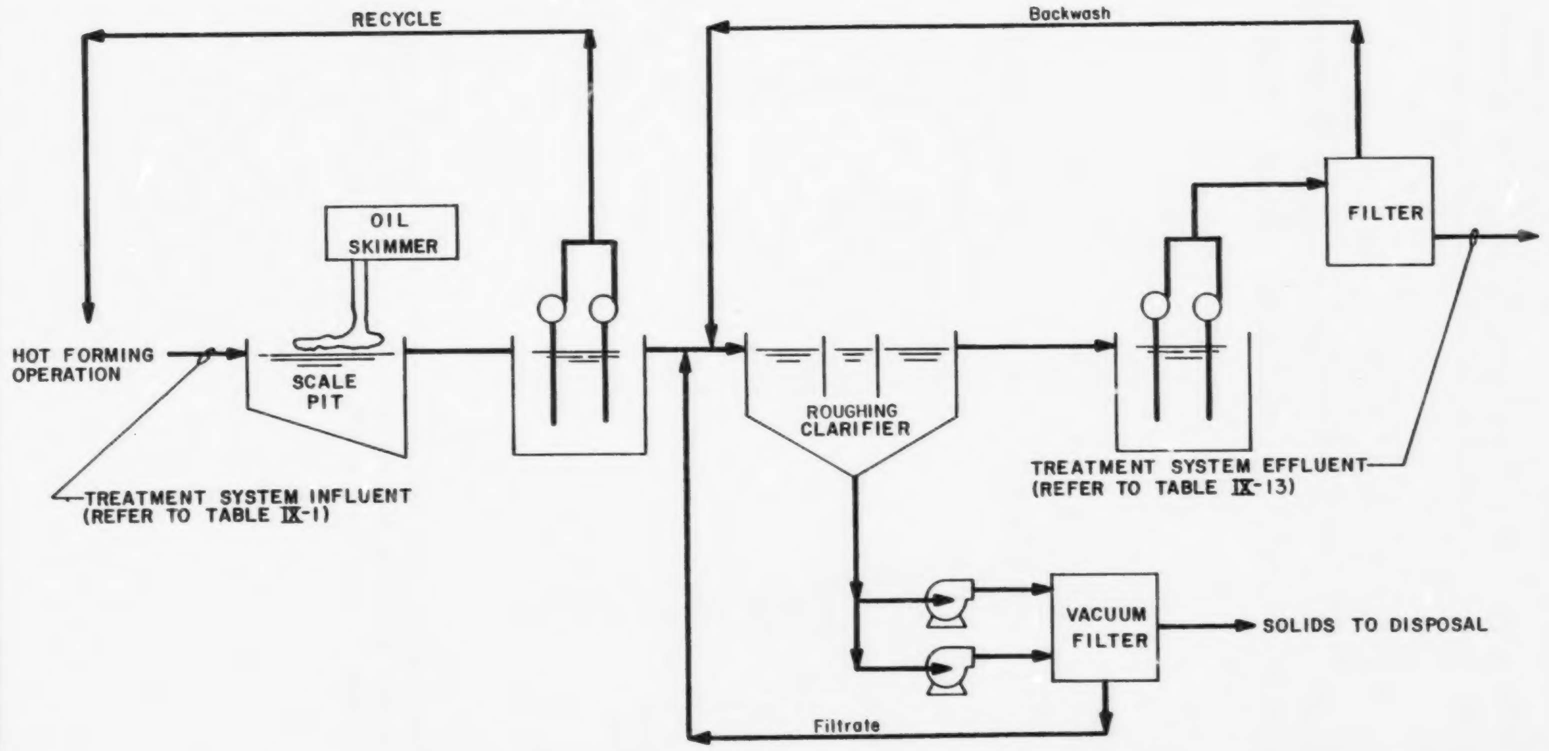
TABLE IX-22

EXAMPLES OF PLANTS IN COMPLIANCE WITH BPT LIMITATIONS
HOT FORMING

	Total Suspended Solids 30-Day Average (lbs/Day)			Oil and Grease Daily Maximum (lbs/Day)		
Plant Code	NPDES Permit	Actual	BPT Limitation	NPDES Permit	Actual	BPT Limitation
020B	-	546	648	-	312	432
060	1461	-	4632	977	-	3088
060K	50	-	254	30	-	177
088A	-	9	501	-	12	334
112B	403	-	2163	271	-	1442
112D	9040	2500	6584	12,000	830	4390
424	-	5	97	-	3	65
432C	570(1)	400-1000(2)	5014	465(1)	400-500(2)	3342
496	-	125	472	-	190	315
584C	2503	1044	4595	2086	728	3063
584F	-	2562	5072	-	3241	3382
684E	1353	118	604	906	37	402
684F	2000	1000	2990	1950	500	1990
796A	250	<80	990	334	<16	660
856B	-	237	1112	-	178	741
856D	-	20	2706	-	13	1804
856H	-	36	2814	-	24	1877
856N	2820	3368	-	626	2245	-
856R	-	26	934	-	6	622
860H	-	200	3900	-	220	2600
864A	1870	-	3903	1640	-	2602
920A	530	-	890	558	-	593
920B	-	1483	1506	-	890	1004
920D	-	20	135	-	25	88
920N	78	-	754	102	-	503

Note: NPDES permit limitations and actual discharges include operations in addition to hot forming for noted plants (*). Only hot forming operations were considered in developing 1982 regulation limitations for all plants.

(1) Net
(2) Gross


RECYCLE
Backwash
OIL SKIMMER
FILTER
HOT FORMING OPERATION
SCALE PIT
ROUGHING CLARIFIER
TREATMENT SYSTEM INFLUENT (REFER TO TABLE IX-1)
TREATMENT SYSTEM EFFLUENT (REFER TO TABLE IX-13)
VACUUM FILTER
SOLIDS TO DISPOSAL
Filtrate

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING
BPT MODEL

Dwn. 1/22/80

FIGURE IX-1

HOT FORMING SUBCATEGORY

SECTION X

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF THE BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE

Introduction

The best available technology economically achievable (BAT) effluent limitations are to be achieved by July 1, 1984. Best available technology is determined by identifying the best economically achievable control and treatment technology employed within the subcategory. Also, where a technology is readily transferable from one industry to another, such technology may be identified as BAT.

This section identifies the two BAT alternative treatment systems considered by the Agency and the resulting effluent levels. In addition, the rationale for selecting the treatment technologies, discharge flow rates and effluent concentrations are presented. The BAT model treatment system selected as the basis for the BAT effluent limitations considered by the Agency is also described. However, as noted below, the Agency determined that adequate control of toxic pollutants found in hot forming wastewaters is provided with the model BPT filtration systems and that more stringent BAT limitations for toxic pollutants based upon the alternatives described below are not warranted.

Identification of BAT

Based upon the information developed in Sections III through VIII the Agency developed the following treatment technologies as BAT for hot forming operations. Those alternatives are illustrated schematically in Figure X-1.

BAT Alternative 1

The BPT treatment system effluent is cooled and recycled such that an overall 96 percent recycle rate is achieved.

BAT Alternative 2

In this alternative, zero discharge is achieved by evaporating and condensing the effluent from Alternative 1 with the condensate returned to the process water system.

Table X-1 presents the effluent quality attainable with the above technologies. The Agency has determined that limitations for lead and zinc based upon filter plant performance (see Appendix A of Volume I) will result in similar control of all toxic metals found in hot forming wastewaters since these metals are found principally in particulate form at low concentrations (<0.1 mg/l).

Rationale for Selection of the BAT Alternatives

The following discussion presents the rationale for selecting the BAT alternative treatment systems, selecting model flow rates, and determining the concentration levels of the pollutants selected for limitation.

Treatment Scheme

The Agency considered additional recycle for the BAT alternatives. The overall recycle rate (combining the BPT and BAT recycles) for hot forming operations was established by reviewing recycle rates in each subdivision and then selecting those recycle rates representative of the best in each case. Those recycle rates greater than ninety percent are considered to be representative of good treatment. Table X-2 presents a summary (from highest to lowest) of the recycle rates observed in the hot forming subcategory. The best recycle rates for each hot forming subdivision follow.

Subdivision	Recycle Rate
Primary	97%
Section	97%
Flat	96%
Pipe and Tube	97%

Based upon these data, the Agency has determined that a ninety-six percent recycle rate is achievable for all hot forming operations. The Agency believes that a common recycle rate for all hot forming operations is appropriate because many plants have central treatment for wastewaters from two or more hot forming subdivisions.

In order to achieve a 96 percent recycle rate, cooling towers are included as part of the alternative treatment system so as to reduce the increased heat loads that can result with extensive recycle systems. As noted in Section VII, many hot forming operations have cooling towers as integral components of recycle systems.

Sulfide precipitation and filtration were also considered as a BAT alternative for the purpose of reducing the levels of the various toxic metals to 0.10 mg/l or less. This technology would not result in any significant improvement in effluent quality as the toxic metals found in hot forming wastewaters are principally in particulate form at concentrations less than 0.1 mg/l. Hence, it was not considered in any detail.

Evaporative technologies are not used in the hot forming subcategory or to any significant extent in the treatment of steel industry wastewaters. Nonetheless, these technologies are demonstrated and available for the treatment of hot forming wastewaters. High capital and operating costs and associated high energy consumption are negative factors associated with this technology.

Applied Flows

The Agency determined average applied flows for each hot forming subdivision for the purposes of sizing and costing treatment systems, and establishing effluent limitations (see Section IX). Production weighted flow averages were determined for each hot forming process (Tables IX-2 through IX-9). All available flow data were used to derive the average flow rates.

Discharge Flows

The discharge flows included in the treatment systems for BAT Alternatives 1 and 2 are based upon recycle of ninety-six percent of the applied flow. Depending upon the subdivision different degrees of recycle were included in the BAT model treatment systems (see Figure X-1). The industry has reported achieving high recycle rates without any problems due to fouling, plugging, or scaling.

Wastewater Quality

The 30 day average effluent concentrations used as the basis for the BAT Alternative 1 and 2 limitations are as follows. The daily maximum values are enclosed in parentheses.

	BAT Alt. 1	BAT Alt. 2
Lead, mg/l	0.15(0.45)	No discharge
Zinc, mg/l	0.10(0.30)	No discharge

As noted above, the Agency considered BAT effluent limitations for lead and zinc. These toxic metals were chosen because of their ability to serve as indicators for the other toxic metals present in hot forming wastewaters. The development of these concentration values is presented in Appendix A to Volume I.

Effluent Limitations for BAT Alternatives

The effluent limitations for the BAT alternative treatment systems were calculated by multiplying the effluent flows of the alternative treatment systems by the effluent concentration of each pollutant and an appropriate conversion factor. Table X-1 presents the effluent limitations for each hot forming subdivision for each BAT alternative treatment system.

Selection of a BAT Alternative

In the proposed regulation, the Agency selected BAT Alternative 1 as the model treatment system upon which the proposed BAT limitations were based. Upon review of existing data and supplemental toxic metals data for BPT hot forming filtration systems, the Agency has determined that high rate recycle of hot forming wastewaters is not warranted for toxic metals control beyond that provided by the model BPT treatment system. The toxic metals data for three hot forming filtration systems are presented in Table X-3. These data show the average concentration of all toxic metals found in filtration system effluents is about 0.07 mg/l. The Agency determined that particulate toxic metals at those levels are effectively controlled by the BPT model treatment system and are not likely to cause toxic effects in receiving waters. In accordance with the criteria established in Paragraph 8(a)(iii) of the Settlement Agreement, the Agency has determined that the BPT effluent limitations provide for sufficient control of toxic metals found in hot forming operations and that more stringent effluent limitations for toxic metals at BAT are not warranted.

TABLE X-1

ALTERNATIVE BAT EFFLUENT LIMITATIONS
HOT FORMING SUBCATEGORY

		Concentration Basis	BAT No. 1 Effluent Limitations (lbs/1000 lbs)							
			Primary Mills		Section Mills		Flat			Pipe & Tube & Mills
		All Hot Forming Operations	Without Scarfers	With Scarfers	Carbon	Specialty	Hot Strip & Sheet	Carbon Plate	Specialty Plate	Carbon & Specialty
Discharge Flow (gal/ton)			90	140	200	130	260	140	60	220
Chromium	Avg.	0.10	0.0000375	0.0000584	0.0000834	0.0000542	0.000108	0.0000584	0.0000250	0.0000917
	Max.	0.30	0.000113	0.000175	0.000250	0.000163	0.000325	0.000175	0.0000751	0.000275
Lead	Avg.	0.10	0.0000375	0.0000584	0.0000834	0.0000542	0.000108	0.0000584	0.0000250	0.0000917
	Max.	0.30	0.000113	0.000175	0.000250	0.000163	0.000325	0.000175	0.0000751	0.000275
Zinc	Avg.	0.15	0.0000563	0.0000876	0.000125	0.0000814	0.000163	0.0000876	0.0000375	0.000138
	Max.	0.45	0.000169	0.000263	0.000375	0.000244	0.000488	0.000263	0.000113	0.000413

BAT alternative No. 2 is a zero discharge system. The effluent limitations for this alternative are, therefore, zero.

TABLE X-2

ANALYSIS OF OVERALL RECYCLE RATES
HOT FORMING SUBCATEGORY

Subdivision	Plant Code	Recycle Rates		
		RUP	RTP	Total
A. Primary	0940	100.0	0	100.0
	0060I	0	100.0	100.0
	0440A	0	100.0	100.0
	0684H	0	99.7	99.7
	0088D	99.0	0	99.0
	0248B	0	98.8	98.8
	0060D	0	98.4	98.4
	0612 (01 & 02)	0	98.0	98.0
	0432J	90.0	7.5	97.5
	0860A (01-03)	0	96.5	96.5
	0320-02	96.2	0	96.2
	0248C	0	93.3	93.3
	0176	0	93.0	93.0
	0864C	0	92.7	92.7
	0432C	44.9	47.4	92.3
	0248A	0	90.3	90.3
	0060	50.0	39.6	89.6
	0476A	0	88.3	88.3
	0920N	0	88.2	88.2
	0496	87.5	0	87.5
	0920A	0	86.2	86.2
	0060G	86.0	0	86.0
	0684A-02	85.7	0	85.7
	0424	0	80.0	80.0
	0672B	80.0	0	80.0
	0724A	79.2	0	79.2
	0864A-01	75.0	0	75.0
	0112A-03	75.0	0	75.0
	0640	70.8	0	70.8
	0920B	68.0	0	68.0
	0948A	63.5	0	63.5
	0112A-01	53.0	0	53.0
	0396E	0	53.0	53.0
	0868A-03	48.8	2.6	51.4
	0188B	0	49.5	49.5
	0684I	0	47.0	47.0
	0856N	47.0	0	47.0
	0460A	0	37.3	37.3
	0946A	9.0	26.0	35.0
	0112B-03	0	34.5	34.5
	0856F	25.0	0	25.0
	0684G	14.7	0	14.7
	0868A-02	0	2.4	2.4

Average of All Values = 74.4%
Average of Values $\geq$90% = 96.6%

TABLE X-2
ANALYSIS OF OVERALL RECYCLE RATES
HOT FORMING SUBCATEGORY
PAGE 2

Subdivision	Plant Code	Recycle Rates		
		RUP	RTP	Total
B. Section	0060I-01	75.0	25.0	100.0
	0060I-02	0	100.0	100.0
	0256N	100.0	0	100.0
	0316A	100.0	0	100.0
	0316B	0	100.0	100.0
	0460A (01 & 02)	0	100.0	100.0
	0672B (01 & 02)	0	100.0	100.0
	0684H (01-03)	0	99.7	99.7
	0684H-05	42.0	57.7	99.7
	0060K-01	0	99.6	99.6
	0060F-05	56.5	43.0	99.5
	0136B-02	0	99.5	99.5
	0860F-03	0	99.5	99.5
	0088D	0	99.2	99.2
	0460B	99.0	0	99.0
	0468B	0	98.9	98.9
	0136B-01	0	98.8	98.8
	0188C	0	98.1	98.1
	0612 (01-04)	0	98.0	98.0
	0188B	0	98.0	98.0
	0384A-06	33.0	64.6	97.6
	0864B	97.3	0	97.3
	0476A-03	97.2	0	97.2
	0640A (01 & 02)	0	97.0	97.0
	0612-05	0	96.8	96.8
	0176 (01-04)	0	96.4	96.4
	0060H-01	32.0	64.0	96.0
	0860H (01 & 02)	0	96.0	96.0
	0946A-03	0	95.8	95.8
	0136C	0	95.1	95.1
	0684H-04	0	94.9	94.9
	0864C (01 & 02)	0	92.7	92.7
	0864A	78.9	12.3	91.3
	0804B-01	0	90.7	90.7
	0860F (01 & 02)	0	90.0	90.0
	0672A (01 & 02)	0	89.6	89.6
	0112-07	0	89.0	89.0
	0476A-02	0	88.8	88.8
	0868A (03-05)	0	86.4	86.4
	0112A-01	0	83.3	83.3
	0946A (01 & 02)	0	82.0	82.0
	0856F-01	66.7	0	66.7
	0468F	0	66.6	66.6
	0920B-01	0	59.4	59.4
	0684E (01 & 02)	0	53.3	53.3

TABLE X-2
ANALYSIS OF OVERALL RECYCLE RATES
HOT FORMING SUBCATEGORY
PAGE 3

Subdivision	Plant Code	Recycle Rates RUP	RTP	Total
B. Section (Cont.)	0856F (02 & 03)	50.0	0	50.0
	0856F-04	44.4	0	44.4
	0316	0	37.0	37.0
	0476A-01	0	33.8	33.8
	0424-01	0	17.0	17.0
	0424 (02 & 03)	0	9.0	9.0
	0060G-01	6.3	0	6.3
		Average of All Values = 84.6%		
		Average of Values >90% = 97.5%		
C. Flat	0248B	0	98.8	98.8
	0060	4.0	94.0	98.0
	0684F-02	18.9	78.7	97.6
	0860H-02	0	97.2	97.2
	0860H-01	0	96.3	96.3
	0868B	0	96.3	96.3
	0176	0	92.8	92.8
	0112-04	89.6	0	89.6
	0868A-03	0	88.5	88.5
	0868A-02	13.6	77.9	88.5
	0868A-01	0	88.5	88.5
	0684B	0	84.5	84.5
	0432C	11.5	69.8	81.3
	0112A-03	71.4	0	71.4
	0856F-02	66.7	0	66.7
	0476A	0	59.8	59.8
	0684I-02	0	53.0	53.0
	0684I-01	0	47.0	47.0
	0920N	40.8	0	40.8
	0920C	33.7	0	33.7
	0320-02	32.3	0	32.3
	0856F-01	22.9	0	22.9
	0860B-01	11.1	0	11.1
		Average of All Values = 71.2%		
		Average of Values >90% = 96.7%		
D. Pipe & Tube	0060R (01 & 02)	0	100.0	100.0
	0856C	99.4	0	99.4
	0684A	0	97.0	97.0
	0728	0	96.8	96.8
	0396E	0	91.0	91.0
	0240B-05	0	87.5	87.5

TABLE X-2
ANALYSIS OF OVERALL RECYCLE RATES
HOT FORMING SUBCATEGORY
PAGE 4

Subdivision	Plant Code	Recycle Rates RUP	 RTP	 Total
D. Pipe & Tube (Cont.)	0796B	0	82.4	82.4
	0548	80.0	0	80.0
	0476A	78.7	0	78.7
	0548A-01	0	77.6	77.6
	0196A	0	64.3	64.3
	0088C-01	0	61.4	61.4
	0548A-02	0	50.0	50.0
	0856F (01 & 02)	50.0	0	50.0
	0796A-02	0	41.6	41.6
	0492A-05	0	18.9	18.9

Average of All Values = 73.5%
Average of Values ≥90% = 96.8%

KEY TO CODES

RUP: Recycle process water from primary scale pit.
RTP: Recycle treated process water.

TABLE X-3

TOXIC METALS CONCENTRATIONS FILTRATION SYSTEMS

Plant Code	(Ref. Code)	Hot Forming Subdivisions Entering System		Cr	Cu	Pb	Ni	Zn
E	(020B)	Primary		0.003	0.01	0.03	0.01	0.03
082(1)	(496)	Primary, Flat		0.01	0.045	0.0	0.035	0.01
088	(684H)	Primary, Section, Pipe & Tube		0.0	0.0	0.0	0.01	0.01
281	(020B)	Primary, Flat		0.0	0.0	0.0	0.0	0.008
283	(112)	Primary, Section		0.0	0.043	0.032	0.0	0.247
288A&B	(584F)	Primary, Flat		0.0	0.0	0.0	0.0	0.043
292	(860B)	Flat		0.0	0.0	0.0	0.0	0.012
294A	(920N)	Primary		0.0	0.0	0.0	0.0	0.030
294B	(920N)	Flat		0.0	0.0	0.0	0.0	0.050
			Averages	0.001	0.011	0.007	0.006	0.049

Sum of the averages: 0.074

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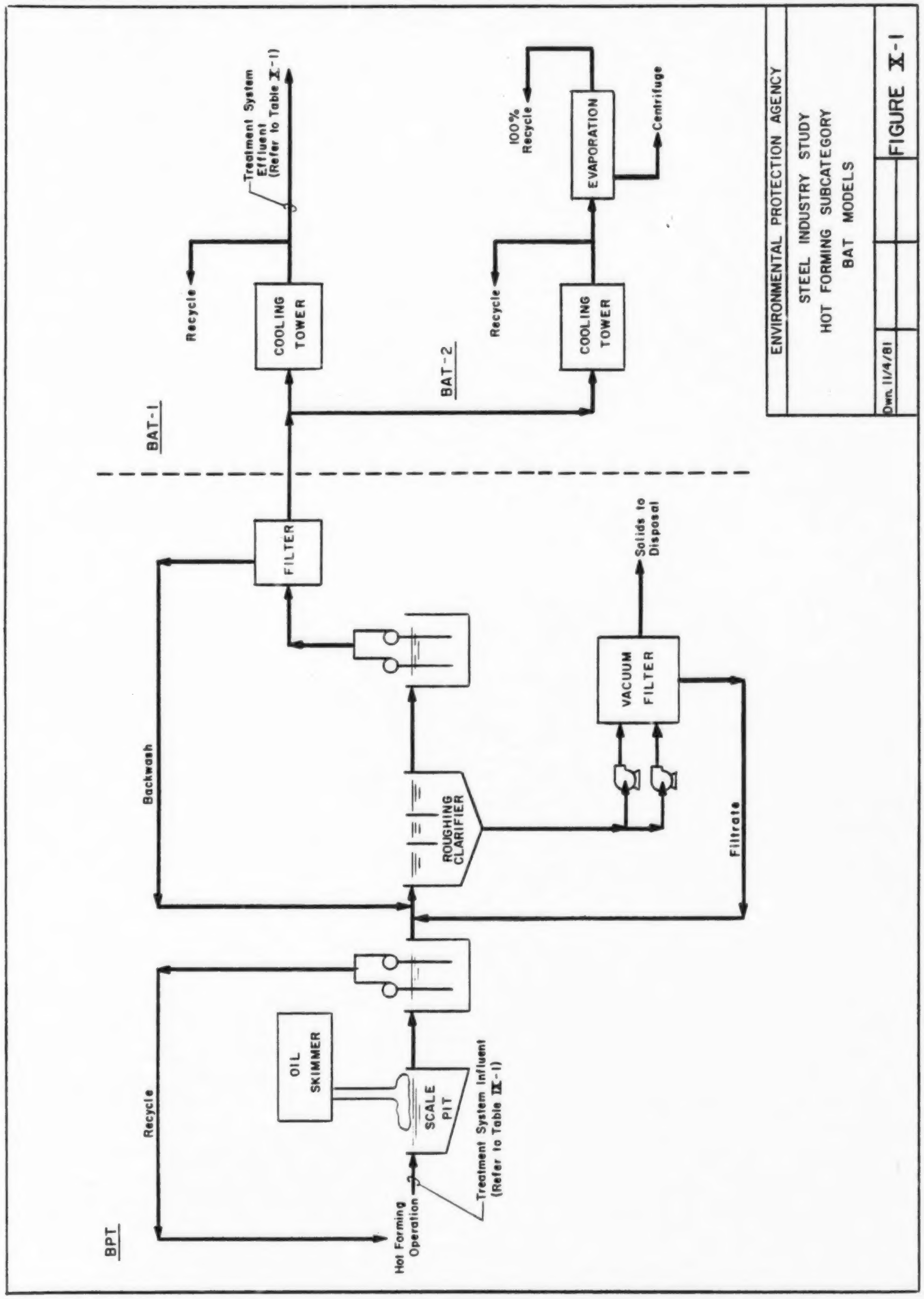
(1) The data shown represent an average of two separate effluent samples.


BPT
Hot Forming Operation
Treatment System Influent (Refer to Table IX-1)
SCALE PIT
OIL SKIMMER
Recycle
ROUGHING CLARIFIER
Backwash
Filtrate
VACUUM FILTER
Solids to Disposal
FILTER
BAT-1
COOLING TOWER
Recycle
Treatment System Effluent (Refer to Table X-1)
BAT-2
COOLING TOWER
Recycle
EVAPORATION
100% Recycle
Centrifuge
Dwn. 11/4/81

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING SUBCATEGORY
BAT MODELS

FIGURE X-1

HOT FORMING SUBCATEGORY

SECTION XI

BEST CONVENTIONAL POLLUTANT CONTROL TECHNOLOGY

Introduction

The 1977 Amendments added Section 301(b)(2)(E) to the Act, establishing "best conventional pollutant control technology" (BCT) for discharges of conventional pollutants from existing industrial point sources. Conventional pollutants are those defined in Section 304(a)(4) [biochemical oxygen demanding pollutants ($BOD\underline{5}$), total suspended solids (TSS), fecal coliform, and pH] and any additional pollutants defined by the Administrator as "conventional" (oil and grease, 44 FR 44501, July 30, 1979).

BCT is not an additional limitation but replaces BAT for the control of conventional pollutants. In addition to other factors specified in section 304(b)(4)(B), the Act requires that BCT limitations be assessed in light of a two part "cost-reasonableness" test. American Paper Institute v. EPA, 660 F.2d 954 (4th Cir. 1981). The first test compares the cost for private industry to reduce its conventional pollutants with the costs to publicly owned treatment works for similar levels of reduction in their discharge of these pollutants. The second test examines the cost-effectiveness of additional industrial treatment beyond BPT. EPA must find that limitations are "reasonable" under both tests before establishing them as BCT. In no case may BCT be less stringent than BPT.

EPA published its methodology for carrying out the BCT analysis on August 29, 1979 (44 FR 50732). In the case mentioned above, the Court of Appeals ordered EPA to correct data errors underlying EPA's calculation of the first test, and to apply the second cost test. (EPA had argued that a second cost test was not required).

Because of the remand in American Paper Institute v. EPA (No. 79-115), the Agency did not promulgate BCT limitations except for those operations for which the BAT limitations are no more stringent than the respective BPT limitations. Hot Forming is one of the subcategories where BCT was promulgated equal to BPT.

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HOT FORMING SUBCATEGORY

SECTION XII

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF NEW SOURCE PERFORMANCE STANDARDS (NSPS)

Introduction

New Source Performance Standards are to consider the degree of effluent reduction achievable through application of best available demonstrated control technology (BDT), processes, operating methods, or other alternatives, including, where practicable, a standard permitting no discharge of pollutants.

Identification of NSPS

NSPS Alternative 1

The first NSPS alternative treatment system includes the BPT model treatment system and the BAT Alternative 1 components discussed in Sections IX and X. This system includes sedimentation of the raw wastewater in primary scale pits equipped with oil skimmers. Both oil and scale removed by this step are reclaimed. A portion of the scale pit effluent is recycled to the process for flume flushing or other mill uses. The scale pit effluent is clarified, filtered, cooled and recycled such that an overall recycle rate of 96 percent is achieved.

NSPS Alternative 2

This alternative is identical to BAT Alternative 2. The blowdown from NSPS Alternative 1 is evaporated, condensed, and returned to the process to achieve zero discharge.

The NSPS treatment systems described above are depicted in Figure VIII-2. The corresponding effluent standards for these systems are presented in Table XII-1. Cost data for the treatment systems is detailed in Tables VIII-30 through VIII-41.

Rationale for Selection of NSPS Alternative Treatment Systems

The NSPS alternative treatment systems developed for the hot forming subcategory are the same as the BAT alternative treatment systems described in Sections IX and X. Therefore, the rationale presented in these sections is applicable to NSPS and is not repeated here. These technologies were considered because of the significant reductions of the total pollutant loadings from hot forming operations.

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Treatment Scheme

The NSPS alternative treatment systems include primary scale pits, roughing clarifiers, oil skimming, deep bed pressure filters, cooling towers, recycle and evaporation. With the exception of vapor compression distillation, all of these technologies are well demonstrated in the hot forming subcategory. As discussed in Section X, sulfide precipitation was considered but not included because of its limited effectiveness for hot forming wastewaters. The other treatment technologies are reliable and demonstrated methods of treatment and are appropriate for NSPS.

The resulting effluent quality for the NSPS alternatives is presented in Table XII-1. As discussed in Section X, the selected pollutants and the respective effluent concentration values are based upon the capabilities of the various water treatment technologies.

Flows

The applied and discharge flow rates that are used with the NSPS Alternatives for the hot forming subcategory were developed in Section X. The discharge flow within each hot forming subdivision is applicable to both NSPS alternative treatment systems. These flows are demonstrated by plants in the respective subcategories and represent an overall system blowdown rate of 4%. The recycle rate of 96% is also well demonstrated in each of the hot forming subdivisions.

Selection of a NSPS Alternative

The Agency selected NSPS Alternative No. 1 as the NSPS model treatment system upon which the NSPS effluent standards are based. The Agency has promulgated NSPS for total suspended solids, oil and grease, and pH. NSPS were promulgated for hot forming operations even though BAT limitations were not promulgated for these operations because of the significant conventional pollutant removal attainable at new sources with high rate recycle systems. Standards for toxic metals were not included since the toxic metals are not likely to be discharged in toxic amounts from NSPS treatment systems. Figure XII-1 depicts the NSPS model treatment system.

Demonstration of NSPS

Tables XII-2 through XII-8 present a list of those plants achieving the NSPS. As shown, these plants encompass all hot forming subdivisions and several different treatment schemes. Since wastewaters from all hot forming operations are similar in character and can be treated to the same degree, demonstration of NSPS in any hot forming subdivision is appropriate demonstration in any subdivision.

TABLE XII-1

NSPS EFFLUENT STANDARDS
HOT FORMING SUBCATEGORY

		Concentration Basis	NSPS Effluent Standards (kg/kkg)							
			Primary Mills		Section Mills		Flat Mills			Pipe & Tube Mills
		All Hot Forming Operations	Without Scarfers	With Scarfers	Carbon	Specialty	Hot Strip & Sheet	Carbon Plate	Specialty Plate	Carbon & Specialty
Discharge Flow (gal/ton)			90	140	200	130	260	140	60	220
Total Suspended Solids	AVG	15	0.00563	0.00876	0.0125	0.00814	0.0163	0.00876	0.00375	0.0138
	MAX	40	0.0150	0.0234	0.0334	0.0217	0.0434	0.0234	0.0100	0.0367
Oil & Grease	AVG	-	Standards will be on a maximum basis only							
	MAX	10	0.00375	0.00584	0.00834	0.00542	0.0108	0.00584	0.00250	0.00918

Note: pH is also regulated at NSPS and is limited to 6.0 - 9.0 standard units for all hot forming operations.

TABLE XII-2

DEMONSTRATION OF NSPS
HOT FORMING: PRIMARY - WITH SCARFERS

	Discharge Flow (gal/ton)	Suspended Solids (kg/kkg)	Oil and Grease (kg/kkg)	pH (Units)	C&TT Components
NSPS	140	0.00876	0.00584	6.0 to 9.0	PSP,SS,RUP,CL,VF, FP,CT,RTP
Plant Visits					
B-2 112B (03)	510	0.0064	0.0047	7.7 to 7.8	PSP,CL,FP,OT
082 496					
140"	170	0.00071	0.0085	7.4 to 7.5	PSP,SSP,CL,FG,OT
140"/206"	460	0.0019	0.017	7.4	PSP,SSP,CL,FG,OT
088 684H	5	0.000038	0.00018	7.6 to 7.8	PSP,FP,RTP-99.7
291 856B	35	0.0012	NA	7.3 to 7.4	PSP,CL,FL,CT,RTP-99
294A 920N	290	0.0085	NA	7.1	PSP,SSP,FP,RTP-88

TABLE XII-3

DEMONSTRATION OF NSPS
HOT FORMING: PRIMARY - WITHOUT SCARFERS

		Discharge Flow (gal/ton)	Suspended Solids (kg/kkg)	Oil and Grease (kg/kkg)	pH (Units)	C&TT Components
NSPS		90	0.00563	0.00375	6.0 to 9.0	PSP,SS,RUP,CL,VF, FP,CT,RTP
Plant Visits						
081	176	51	0.0038	0.0021	7.8 to 8.1	PSP,TP,RTP-93
083	860H	12	0.00039	0.00076	7.1 to 7.6	PSP,CL,CT,RTP-96

---

(1) This data represents the discharge from preliminary treatment prior to central treatment.

TABLE XII-4

DEMONSTRATION OF NSPS
HOT FORMING: SECTION - CARBON

	Discharge Flow (gal/ton)	Suspended Solids (kg/kkg)	Oil and Grease (kg/kkg)	pH (Units)	C&TT Components
NSPS	200	0.0125	0.00834	6.0 to 9.0	PSP,SS,RUP,CL,VF, FP,CT,RTP
Plant Visits					
F-2 384A	140	0.017	0.0048	7.8 to 8.5	PSP,SSP,SS,CL,FLL, FLP,NW,VF,CT,RTP-98
G-2 640A	0	0.0	0.0	7.4 to 8.1	PSP,SS,SL,FD,CT,RTP-100
083 860H					
34" Mill	180	0.00082	0.015	7.1 to 7.6	PSP,CL,CT,T,RTP-96
290B 856R	192	0.0062	NA	8.9 to 9.1	PSP,SS,FLP,CL,FP, RTP-79.7,RUP
088 684H					
10"/11"	10.2	0.00081	0.00068	8.5 to 9.5	PSP,SSP,SB,CL,T,VF FLP,RTP-99.7
36"	14	0.000090	0.00016	7.6 to 7.8	PSP,FD,CL,T,VF,RTP-99.7
32"	2.8	0.000025	0.00018	7.6 to 7.8	PSP,FD,CL,T,VF,RTP-99.7
14"	10	0.0036	0.00063	7.5	PSP,CT,CL,RUP-44,RTP-55.7

TABLE XII-5

DEMONSTRATION OF NSPS
HOT FORMING: SECTION - CARBON

	Discharge Flow (gal/ton)	Suspended Solids (kg/kkg)	Oil and Grease (kg/kkg)	pH (Units)	C&TT Components
NSPS	130	0.00814	0.00542	6.0 to 9.0	PSP,SS,RUP,CL,VF, FP,RTP
Plant Visits					
088 0684H					
34" Mill	1.7	0.000012	0.000033	7.6 to 7.8	PSP,FD,CL,T,VF,RTP 99.7

TABLE XII-6

DEMONSTRATION OF NSPS
HOT FORMING: FLAT - HOT STRIP & SHEET

		Discharge Flow (gal/ton)	Suspended Solids (kg/kkg)	Oil and Grease (kg/kkg)	pH (Units)	C&TT Components
NSPS		260	0.0163	0.0108	6.0 to 9.0	PSP,SS,RUP,CL,VF, FP,CT,RTP
Plant Visits						
L-2	060	76	0.00160	0.0025	8.6 to 8.7	PSP,FLL,FLM,CL,VF, CT,RTP-98.3
N-2	396D	0	0.0	0.0	-	PSP,CT,VF,CL,F(UNK) S(UNK),RTP-100

TABLE XII-7

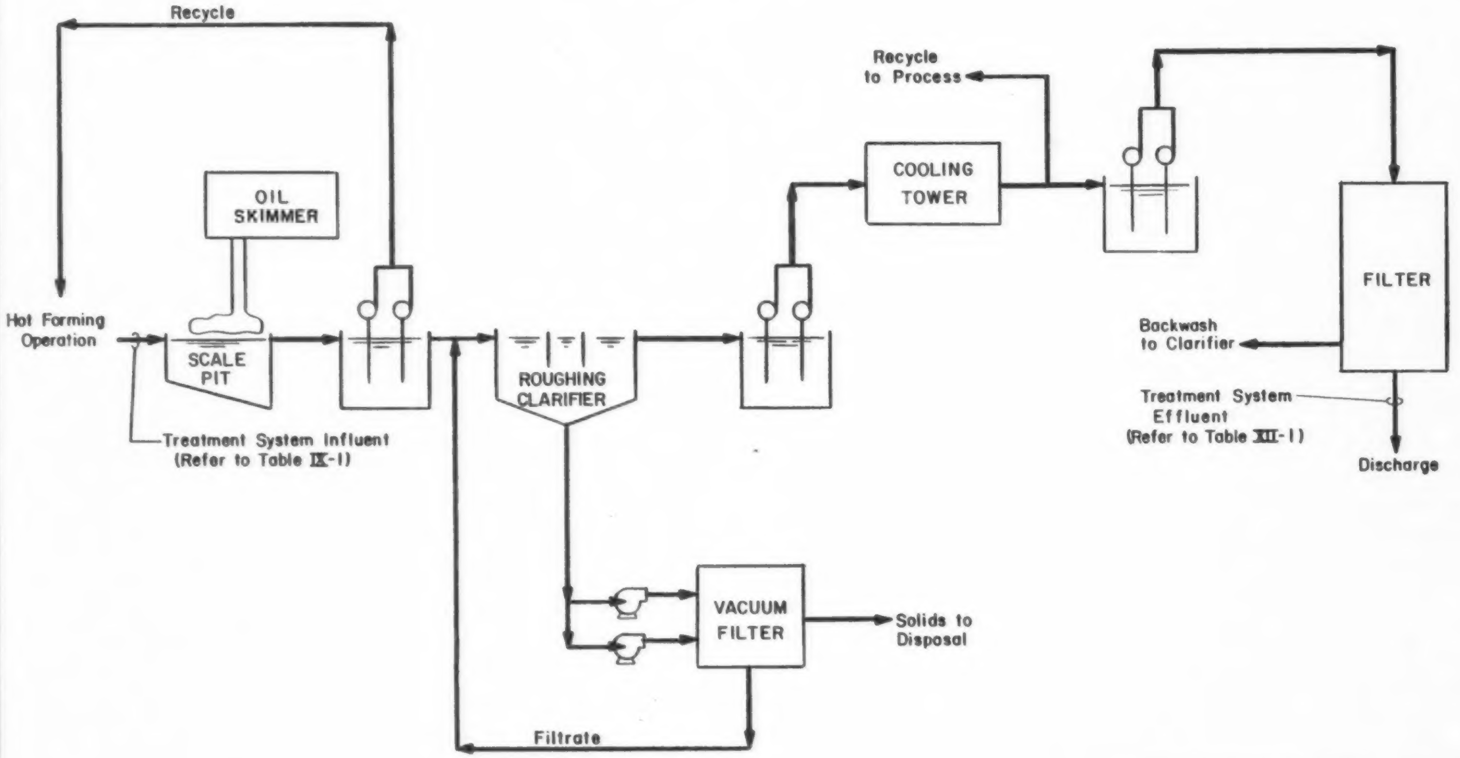
DEMONSTRATION OF NSPS
HOT FORMING: FLAT - CARBON PLATE

	Discharge Flow (gal/ton)	Suspended Solids (kg/kkg)	Oil and Grease (kg/kkg)	pH (Units)	C&TT Components
NSPS	140	0.00876	0.00584	6.0 to 9.0	PSP,SS,RUP,CL,VF, FP,CT,RTP
Plant Visits					
K-2 868B	100	0.0022	0.0026	7.0 to 7.3	PSP,SSP,T,Filter,CT,RTP-97
082 496					
112"/120"	870	0.0064	0.064	7.4	PSP,SSP,DR,FG,OT
140"	120	0.00088	0.0088	7.4	PSP,SSP,DR,FG,OT
140"/206"	210	0.0021	0.018	7.4	PSP,SSP,DR,FG,OT
083 860H	360	0.00011	0.0014	7.1 to 7.6	PSP,CL,CT,RTP-96.3

TABLE XII-8

DEMONSTRATION OF NSPS
HOT FORMING: PIPE & TUBE

		Discharge Flow (gal/ton)	Suspended Solids (kg/kkg)	Oil and Grease (kg/kkg)	pH (Units)	C&TT Components
NSPS		220	0.0138	0.00918	6.0 to 9.0	PSP,SS,RUP,CL,VF, FP,CT,RTP
Plant Visits						
GG-2	240B	0	0.0	0.0	-	PSP,Oil Separator,SL, RUP-100
JJ-2	728	0	0.0	0.0	-	PSP,SL,RTP and RET-100
088	684H	21	0.00021	0.00087	7.6 to 7.8	FP,VF,FLL,FLP,CT,CL,T, RTP-99.7


Recycle
OIL SKIMMER
Hot Forming Operation
SCALE PIT
Treatment System Influent (Refer to Table IX-1)
ROUGHING CLARIFIER
VACUUM FILTER
Solids to Disposal
Filtrate
COOLING TOWER
Recycle to Process
FILTER
Backwash to Clarifier
Treatment System Effluent (Refer to Table XII-1)
Discharge

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT FORMING SUBCATEGORY
NSPS MODEL

Dwn. 11/16/81

FIGURE XII-1

HOT FORMING SUBCATEGORY

SECTION XIII

PRETREATMENT STANDARDS FOR DISCHARGES TO PUBLICLY OWNED TREATMENT WORKS

Introduction

The Agency found that wastewaters from less than 10% of the hot forming operations are discharged to POTWs. Because of the high volume of untreated hot forming wastewaters it is not practical to discharge these wastewaters to POTWs untreated on a once-through basis. Accordingly, most steel industry discharges of hot forming wastewaters to POTWs are blowdowns from high rate recycle systems that are equivalent to the Agency's BAT Alternative 1 treatment system. The Agency has determined that toxic pollutants are effectively controlled at all hot forming operations with discharges to POTWs. Thus, the Agency has determined that the general pretreatment standards are sufficient to control the discharge of hot forming operations to POTWs.

General Pretreatment Standards

For detailed information on Pretreatment Standards refer to 46 FR 9404 et seq, "General Pretreatment Regulations for Existing and New Sources of Pollution," (January 28, 1981). See also 46 FR 4518 (February 1, 1982). In particular, 40 CFR Part 403 describes National Standards (prohibited discharges and categorical standards), revisions of categorical standards, and POTW pretreatment programs. The Agency considered the objectives and requirements of the General Pretreatment Regulations in deciding not to promulgate categorical pretreatment standards for hot forming operations.

Wastewaters from about twenty hot forming operations are discharged to POTWs. In many cases, these wastewaters are recycled to a high degree to minimize user fees to the industry and to avoid hydraulically overloading POTWs. The Agency believes that future discharges of hot forming wastewaters to POTWs, if any, will receive similar treatment and will not contain high levels of toxic metals. The Agency believes that the pass through of toxic pollutants from hot forming operations is not a problem. Thus, categorical pretreatment standards for hot forming wastewaters are not warranted.

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